



1993 Catalog

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ASC/2 Series

NEMA TS2 Actuated Controllers

Features

- Exceeds requirements of NEMA TS2-1992 and TS1-1989
- TS2 Type 1 version with RS-485 serial interface
- TS2 Type 2 version with NEMA TS1 interface
- TS2 Type 2 version with ASC-8000 interface
- 16-line by 40-character backlit display
- Context-sensitive help screens
- Long list of advanced coordination, preemption and TOD features
- Fully compatible with Econolite systems

Description

In 1987, Econolite introduced the ASC-8000 NEMA TS1 controller, which set the standard for menu-driven programming and control flexibility. The ASC/2 controller family now provides both TS1 and TS2 compatibility plus a combination of features never seen before in the traffic industry. These include the large number of detector inputs, processing power and memory addressing required for advanced IVHS and ATMS applications.



State-of-the-art 32-bit microprocessor design and a 5-year warranty will put the ASC/2 family at the leading edge of traffic technology for years to come. In spite of their power, the ASC/2 controllers are remarkably easy to program, with menus and context-sensitive help shown on a 16-line by 40-character screen. Most users will be entering data in less than five minutes with little or no instruction.

The ASC/2 controller family consists of three models with the same control capability but a different input/output (I/O) structure. Sharing much of the same hardware is the ASC/2M zone master.

ASC/2-1000: TS2 Type 1

The first version, the ASC/2-1000 meets the requirements of the NEMA TS2-1992 Type 1 standard. Its interface controls all I/O over a high-speed RS-485 serial bus (Port 1) with digital addressing to simplify cabinet wiring. This bus is interfaced directly to a TS2-compatible Malfunction Management Unit (MMU).

Traffic cabinet equipment, such as the detector rack, is interfaced via one or more TS2-specified Bus Interface Units (BIUs). Each BIU controls up to 15 outputs, 24 input/outputs, 8 inputs, and four

optically-coupled inputs. The Type 1 standard also provides an RS-232C terminal (Port 2) and a standardized telemetry interface (Port 3) for the controller.

ASC/2-2000: TS2 Type 2

The second version of the ASC/2 family, the ASC/2-2000, meets the requirements of the NEMA TS2 Type 2 standard. It provides the RS-485 serial bus, RS-232C port and telemetry port of Type 1 plus industry-standard circular connectors (A, B & C) for compatibility with existing NEMA TS1 equipment.

NEMA TS2 Type 2 controllers may operate in any one of eight I/O modes, which assign specific functions to 24 input and 24 output connections. The first of these I/O modes (Mode 0) provides compatibility with the I/O requirements of the NEMA TS1 standard, and the controller can be programmed to operate as a TS1 unit. A minimum of 20 vehicle detectors can be connected directly to the controller using the assignable input and output channels.

A special feature of the ASC/2-2000 allows it to be operated as a Type 1 controller, with all cabinet interfacing over the high-speed RS-485 serial bus.

ASC/2-2100: ASC-8000 interface

The third member of the ASC/2 family, the ASC/2-2100, provides all of the capabilities of the previous two models plus an I/O expansion module for compatibility with Econolite's ASC-8000 controller. It adds a D connector, a telemetry connector and a NEMA overlap card connector which match those of the ASC-8000. This allows the ASC/2-2100 to be used as a replacement for an ASC-8000 without any changes to the existing cabinet.

Modular hardware

All ASC/2 controllers (and the ASC/2M zone master) share the same aluminum enclosure, which measures a compact 9" x 15" x 9 1/2" (H x W x D). A keyboard/display panel, which is common to all models, provides a weather and dustproof elastomeric keyboard with numeric, function and cursor control keys, plus a high-contrast 16-line by 40-character LCD display with LED backlighting. Each of the models has its own I/O interface panel with a specific connector layout.

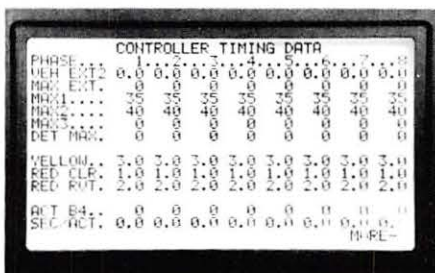
The same processor module is shared by all ASC/2 models and is mounted on the inside of the hinged front panel. It contains all timing and control logic, a powerful 32-bit microprocessor, and associated memory (battery-backed CMOS RAM, EPROM or flash EEPROM). User data is stored in a small plug-in EEPROM data module, which can be transferred from controller to controller. Each of the ASC/2 models has its own I/O interface module, which includes a connector for an optional 1200 bps FSK modem for communication with a zone master (ASC/2M or KMC-10,000).



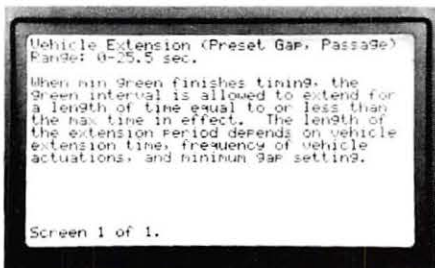
The ASC/2 opens like a book for easy access to the electronics.



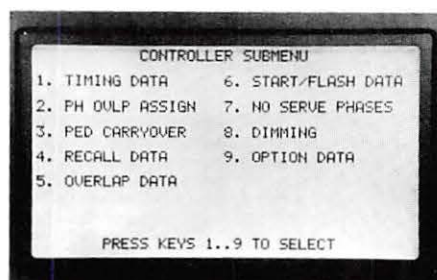
ASC/2 main menu



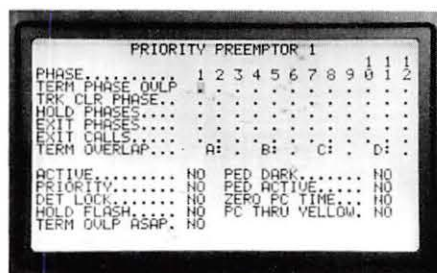
Timing data (first of two screens)



Typical context-sensitive help screen



"Controller" submenu



Priority preemptor screen



Status display

For ease of service, all electronic modules other than the power supply are easily removable from the front using a standard screwdriver. Power and signal connections to the circuit boards are via plug-in connectors. Electronic troubleshooting can be done without extender boards. Like other Econolite controllers, all members of the ASC/2 family are burned in under power at elevated temperature before shipment and carry a full five-year warranty.

Easy to use

Traffic controllers have typically been difficult to program, in part due to limited display and keyboard capability. Not so with the ASC/2. With a 16-line alphanumeric liquid crystal display and eight dedicated function keys, the ASC/2 provides easy menu-driven programming, traffic engineering terminology prompts, simple cursor control for data entry, and dynamic status displays. Function keys such as NEXT SCREEN, NEXT DATA and NEXT PAGE allow quick movement

between fields. Context-sensitive help is available for any data entry by simply pressing the HELP key. Dynamic status displays include timing, coordination, preemption, NIC/TOD, telemetry, detectors, and MMU. Error and diagnostic messages help with fault isolation.

Easy to program

Traffic terminology terms lead from a main menu to specific data fields via submenus: configuration, controller, coordinator, preemptor, NIC/TOD functions, detectors, status display, utilities and diagnostics. Data input uses numeric keys and a special TOGGLE key, which makes the YES/ON or NO/OFF selections to enable/disable specific functions. The elastomeric keys, which include a four-arrow cursor control key, provide both tactile and audio feedback. The 16-line by 40-character LCD display provides eight keyboard-adjustable contrast settings and LED backlighting for easy viewing under all lighting conditions.

ASC/2 Series controllers offer a unique combination of features to solve demanding traffic control problems

Control features

- 12 phases, 8 concurrent groups, 2 timing rings.
- All standard NEMA TS1 and TS2 timing functions.
- Alternate vehicle extension time.
- Pedestrian clearance through yellow.
- Pedestrian timing carryover.
- Guaranteed minimum times for minimum green, walk, pedestrian clear, yellow, red, and red revert.
- Density functions with addition of actuations before added and cars waiting.
- Restricted concurrent phase service.
- Five-section left-turn head control.
- Soft recall.
- MUTCD flash with flash entry and exit phases selectable from keyboard.
- Simultaneous gap termination by concurrent group.
- Keyboard programming of sequence and configuration.
- Power on flash or all red time.
- Dimming by load switch and color.
- Four max green times for each phase, including detector fail max.
- Dynamic extension of max time based on vehicle demand.
- Overlaps programmed from the keyboard or NEMA overlap card.
- Standard and protected-permissive overlaps.
- Lagging, leading or advanced green timed overlaps.
- Program up to 16 overlap movements.
- Backup protection by concurrent group.

Coordinator features

- 64 coordination patterns, each with its own cycle, offset and split.
- Three interconnect methods: plan, TS2, standard.
- Offset and split entries in percent or in seconds.
- Ability to reference offset to coordinated phase green, yield or force-off.

- Ability to select coordinated, recall, max recall, ped recall and omit phases, and phase sequence for each coordination pattern.
- Fixed or floating force-off.
- Dual yield points allowing flexible lead-lag phasing.
- Actuated or non-actuated coordinated phases.
- Pickup cycle to provide smooth and orderly transition from free to coordinated operation.
- Split interval for each controller phase, allowing coordination of up to 12-phase sequential intersections.
- Phase reservice during coordination.
- Local split demand operation.
- Dual coordination capability.
- Three methods of offset correction: smooth transition, add-only, dwell.
- Operation as a local controller or a master coordinator.
- Three permissive operations: automatic permissive, dual permissive, single permissive.
- Automatic calculation of yield point, permissives and force-offs from split intervals.
- Manual override.
- Manual command using NIC sync.
- Built in diagnostics to detect coordination and hardware failures.
- Multiple coordination operating modes including: time-based, hardwire, telemetry, time-based backup for hardwire or telemetry interconnect, time clock master/coordinator in an interconnected system.

Preemptor features

- Six priority and four bus preemption sequences.
- Prioritized or first-come, first-served operation.
- Lock or non-locked preempt call.
- Preempt delay, inhibit, duration and maximum timing in addition to green, clearance, hold, and flash internal timing.

- Guaranteed minimum green and pedestrian clearance times.
- Overlap and pedestrian indication control during preemption.
- Multiple hold interval options: green, all red, flash, and limited service.
- Preempt active outputs.
- Exit phase control.
- Phase maximum time override following preemption.
- Linking of priority preemptors for multiple track clearances or complex sequences.

Time-of-day features

- Separate control for NIC® (non interconnected coordination) and TOD (time of day) functions.
- 16 day programs.
- 10 week programs.
- Year program with 53 weeks.
- 36 holiday programs, fixed or floating.
- Up to 200 NIC program steps each allowing selection of coordination pattern and system override.
- Up to 100 TOD program steps each commanding: flash, dimming, red rest, alternate vehicle extension, detector logging and diagnostic plan, phase sequence; selection by phase of MAX2, MAX3, recall, conditional service inhibit and omit; and eight special functions.
- Manual selection of NIC or TOD program step.
- Keyboard selectable sync reference point and resync time.
- Automatic compensation for leap year.
- Daylight savings time control.
- Day of week and week of year automatically calculated and displayed.
- External time reset capability.
- Timing accuracy:
 - 1) With power applied, accuracy of 60 Hz line frequency.
 - 2) With power removed, drift of less than 25 ppm.

Detector features

- Up to 64 vehicle detectors.
- Up to 16 system and speed detectors.
- Speed determined by single detection or two-detector speed trap.
- Vehicle detectors assignable to phase and function.
- Twelve pedestrian detector inputs.
- Delay and extended timing.
- Detector disconnect and switching.
- Nine detector types, including:
 - Stop bar detector with and without timing.
 - Calling detectors.
 - Bicycle detectors.
 - Dilemma zone detectors.

Telemetry features

- Compatible with KMC-10,000 or ASC/2M-1000 zone masters.
- 1200 bps FSK modem.
- System command processing for selection of coordination pattern, master zero and four special functions.
- Readback of intersection status including vehicle, pedestrian and overlap color, local detector activity, preempt call activity, coordination status, and local time.
- Split usage monitoring.
- Readback of volume and occupancy data for up to 16 system detectors and speed for up to two speed detectors.
- Upload/download of data base.
- Keyboard or external selection of system address.

Configuration features

- Keyboard selection of phase sequence, phases in use, exclusive pedestrian phases, and phase to load switch assignment.
- Type 1 controller options include: BIU enabling for terminals & facilities and detector racks; MMU disabling; diagnostic frame enabling; and peer-to-peer message enabling.
- Supervisor and data change access codes.

Diagnostic features

- Power-ON diagnostics to verify memory (RAM, PROM, EEPROM), MMU programming, and microprocessor operation.
- Continuous, automatic run-time diagnostics to verify essential elements of controller operation including: PROM, EEPROM, Port 1 communications, and microprocessor.
- Operator-initiated diagnostics to verify operation of inputs, outputs, keyboard and display.
- Time-of-day controlled detector diagnostics to test detectors for no activity, maximum presence, and erratic output.
- BIU-connected detector diagnostics to test for watchdog failure, open or shorted loops, and excessive inductance change.

Logging features

- Separate log buffers for detectors, detector failures, and events.
- Detector logging:
 - Automatic volume, occupancy and average speed logging for selected vehicle and speed detectors.
 - Detector logging interval selectable as 5, 15, 30 or 60 minutes.
 - Detector logging enabled or disabled by time of day.
- Detector failure logging:
 - Storage buffer for a minimum of 100 time and date-stamped detector events.
 - Failure logging of no activity, maximum presence, erratic output, watchdog timeout, shorted loop, open loop, and excessive inductance change.
 - Recovery logging as failed detectors return to on-line operation.
 - Disable feature for detector failure logging.
- Event logging
 - Storage buffer for a minimum of 200 time and date-stamped events.
 - Events logging of Port 1 communication failures, coordination faults, MMU and local flash status, preempt events, power ON/OFF, low battery, and up to 16 alarms.

- On-line reporting when an event or failure returns to normal status.
- Event logging enable on a category basis.
- Individual enabling of alarms.

Status display features

- Keyboard selection of detailed dynamic status displays for each of the main controller unit functions, including: controller, coordinator, preemptor, NIC/TOD, detectors, MMU.

Utility features

- Copy for phase timing, coordination pattern split data, and backup data.
- Clear entered data.
- Print entered data.
- Print detector and event logs.
- Transmit data from one controller to another.
- Display controller sign-on message.
- Enable/disable keyboard audio feedback.
- Control LCD backlight.

Ordering Guide

Format: ASC/2-XXXX-X-X

First X: Controller type

- 1 = TS2 Type 1
- 2 = TS2 Type 2

Second X: Expansion I/O

- 0 = Standard I/O
- 1 = ASC-8000 compatible expansion I/O (for TS2 Type 2 only)

Third X: Telemetry option

- 0 = No telemetry
- 1 = 1200 bps FSK modem
- 2 = RS-232C

Fourth X: Reserved

Fifth X: Data module option

- 1 = Standard data module (32 detectors, 50 TOD steps, 100 NIC steps)
- 2 = Expanded data module (64 detectors, 100 TOD steps, 200 NIC steps)

Sixth X: Overlap card option

- 0 = No overlap card
- 1 = NEMA-type overlap card

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6202-10021M-01



ASC - 8000

The ASC-8000 Advanced System Controller is the culmination of extensive research into customer needs, system applications, and microprocessor based technology, combined with Econolite's 50 plus years of traffic control experience. This research has resulted in a system ready controller with a long list of advanced standard features combined with a programming method so easy to learn that most users can be entering data in less than five minutes with little or no instruction.

Keyboard programmable controllers have typically been difficult to program in part due to limited display capability and varying keyboard entry sequences. **Not so with the ASC-8000.**

Through the use of a multi-line alphanumeric Liquid Crystal Display the ASC-8000 provides easy to use menu driven programming, traffic engineering terminology prompts, simple cursor control of data entries, and an extensive status display capability.

Easy to use programming and advanced display capabilities are only two of many features of the ASC-8000. Features exceeding NEMA TS1-1983 standards, state of the art microprocessor design combined with a 5 year warranty put the ASC-8000 at the leading edge in traffic technology.

EXPANDED FEATURES

DATA ENTRY

Traffic terminology menus lead the user from a main menu to more specific programming areas: Controller, coordination, preemption, detection, time-of-day programming, telemetry, display, utilities and options. All data is input using numeric and cursor keys and consists of number entries and YES/ON or NO/OFF selections which enable or disable controller functions. Easy to read keys provide both tactile and audio feedback. The 4 line by 40 character LCD display has eight keyboard adjustable contrast settings and E-L backlight providing easy to read displays under all lighting conditions.

MAIN MENU

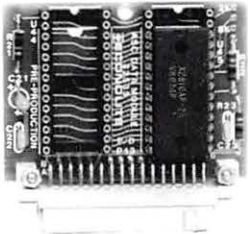
- | | | |
|----------------|--------------|-----------------|
| 1. CONTROLLER | 4. NIC/TOD | 7. STATUS DISP. |
| 2. COORDINATOR | 5. TELEMETRY | 8. UTILITIES |
| 3. PREEMPTOR | 6. DETECTORS | 9. OPTIONS |

CONTROLLER SUBMENU

- | | |
|-----------------|---------------------|
| 1. TIMING DATA | 4. START/FLASH DATA |
| 2. OVERLAP DATA | 5. OPTION DATA |
| 3. RECALL DATA | |

DATA MODULE

One small plug-in module contains intersection configuration, timing, and operation data. The data can thus be easily transferred from one controller to another. The EEPROM which stores this information retains all data during power or battery failures.



DYNAMIC DISPLAYS

Extensive monitoring capabilities are provided by eight dynamic displays. Overall and specific intersection timing is easily viewed. Displays include error messages which help with fault isolation.

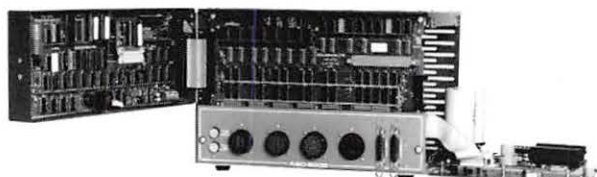
2 MGRN	6 T/N	-T-	-	-	-T-	-	5% PERM
PCLR	15 VEH	R-	-R-	R-R-	-R-R	NIC-112	
6 MGRN	6 PED	-N-	-R-	-N-	-R		
PCLR	15 PRE	/	/	/	/	17:40:55	

TERMINAL INTERFACE

Expanded communication capabilities include: Data transfer between ASC-8000 controllers, printers, and personal computers.

MODULAR DESIGN

Disassembly is simple. Four modules make up the controller: Processor/Display, I/O Interface, Power supply, and Telemetry (optional). All modules may be quickly removed and replaced. Easy access to all modules without the use of extender cards simplifies maintenance.



PROGRAMMING FLEXIBILITY

Engineered to satisfy customer needs, flexible programming gives the user control of many powerful traffic techniques.

- System ready controller with coordination, preemption, and time-of-day included as standard functions.
- Phase sequence allows any combination of up to eight phases, two timing rings and six concurrent groups.
- Expanded detector input capabilities overcome standard detector limitations. Sixteen detector inputs programmable as to phase and function including extend or delay, stop, and calling detectors. Cross switching can be used to apply detector inputs to other phases.
- Guaranteed minimum times for major timing intervals.
- Overlap capabilities: Up to twelve overlaps, protected-permissive and timed overlaps, keyboard or NEMA overlap card programmable.
- Five-Section-Left-Turn-Head programming with simple YES and NO selection.
- Soft recall allows selection of rest phases.
- Conditional Service and Reservice allow phase re-timing after normal service.
- Simultaneous Gap Termination for simultaneous phase gap-out in both timing rings.
- Back-up Protection inhibits service of left-turn phases within the same concurrent group for protected-permissive left turns.
- Dynamic Extension of max timers extend the programmed max timer up to a third MAX time based on vehicle demand.
- Dimming is enabled by phase, color, overlap, and time-of-day.
- MUTCD flash operation with keyboard selectable flash phases.
- Provisions for handling Canadian advanced green and early walk indications.

AVAILABLE OPTIONS

- Fiber optic telemetry interface.
- Menu driven diagnostics for component and circuit testing.
- ASC-8000RM rack mounted version with type 170 connector interface.

COORDINATION

SPECIAL FEATURES

Efficient and flexible coordination techniques are easy to implement with ASC-8000 programmability.

- 6 cycles, 5 offsets and 4 splits per cycle.
- Automatic calculation of yield and force off points.
- Three permissive periods: Automatic, Dual and Single.
- Three methods for offset correction: Smooth Transition, Add Only Smooth Transition, and Dwell.
- Split demand allows local split selection to handle critical or problem traffic movements.
- Nonactuated or actuated coordinated phase. Dynamic split allows extension of coordinated phase split.
- Coordinated phase selectable per cycle.
- Lead-lag phase sequence selectable per cycle.
- Omit phases on a per cycle or per split basis.
- Recall programmable per cycle.
- Crossing artery split selection for synchronization between main and crossing arteries.
- Sync monitor detects loss of sync and selects NIC® mode as backup.
- Plan commands for multiple zone coordination.
- Coordinator display shows command source, current cycle, offset, split, system and local cycle in percent, commanded and actual offset, offset correction, hold, force-off, permissive, and green band indicators.

```

CMD-NIC   LOC CYC 35%   RING 1 2 DIR
CYC-1 90   SYS CYC 98%   HOLD   1 2
OFT-1     CMD OFT 50%   F.O.
SPL-2     ACT OFT 62% ADD PERM 4 8
  
```

MODES OF OPERATION

- Noninterconnected coordination — using time-of-day programming.
- Telemetry — Provides complete systems capabilities.
- Standard, Fixed Time or TM series — Hardwire interconnect.
- Free — Controller operates on its own timing in a fully actuated mode.
- Time-of-day master/local controller — Hardwire interconnect.

MANUAL OVERRIDE

Manually set controller operation in any cycle, offset, split or free. Manual commands override other coordinator source inputs.

NONINTERCONNECTED COORDINATION

Time-of-day programming defines the operation of the NIC® coordination and backup mode.

- Patented time-base provides accurate time and date information. Time drift with power removed is less than 25 ppm (parts per million).
- Automatic daylight savings and leap year adjustment.
- Dynamic status display shows time, date, current program, weekly program, next step and time, current program step, cycle, offset, split, flash, max timer and special functions selected.

```

18:02:59  3/11/88      MAX SPECIAL
STEP PGM TIME  C/O/S FL DIM 2 3 1 2 3 4
  22   1 8:46 1/1/2      X  X  X
WEEKLY PGM 01      NEXT STEP 7 23:00
  
```

- Yearly program with 53 weeks.
- Ten weekly programs to accommodate both normal and seasonal traffic patterns.
- 16 day programs.
- 36 holiday programs override normal day programming. Select date, program number and repeat feature. Repeat allows program to be in effect the following year.
- 160 program steps available for creating day programs. Each step selects starting time, cycle, offset, split and optional selection of flash, max timers, dimming, and control of four special outputs.

PREEMPTION

PRIORITY PREEMPTORS

Six priority preemptors allow multiple railroad or emergency vehicle preempt sequences. Priority preemption options include:

- Preemptors can be linked for complex or varied preemption sequences including multiple track clearance phases.
- Preemptors served on priority or nonpriority basis.
- Locking or non locking preemptor call.
- Hold options allow emergency lane green, all red, limited service, or flash conditions.
- Preemptor can override controller timing except during limited service in the Hold interval.
- Pedestrian indicators can be selected as ON, OFF or operational during preemption.
- Overlaps may be terminated at the beginning of preemption.
- Special timers: Duration of preemption sequence, Delay time between receipt of preemptor call and initialization of preemption, Inhibit time to stop normal phase sequencing.
- Easy selection of track clearance, hold and exit phases.
- Selection of calls to be placed after preemption.

BUS PREEMPTORS

Four bus preemptors allow preferential service for bus traffic. Programming options include:

- Reservice time control of repeated preemptor service.
- Delay time between receipt of bus preemptor call and start of preemption sequence.
- Inhibit time stops normal phase sequencing before preemption.
- Preemptor interval times for green, yellow, red, and pedestrian clearance.
- Selection of phases in effect during preemption.
- Direct interface to Opticom high and low priority preempt calls.
- Preemptor dynamic status display shows preemptor timing interval and status plus indications for calls, inhibit, delay and bus reservice timers.

PRIORITY					BUS				PMT 1			
1	2	3	4	5	6	1	2	3	4	PHASE	4	T/C YEL 2.5
A	D		C					A		PHASE	8	T/C YEL 2.5
												DURATION 017

TELEMETRY

SYSTEM APPLICATIONS

Designed for system applications, the ASC-8000 can be a local or master controller operating in a hardwire interconnected system or part of a non-interconnected time-based system. When equipped with an optional Telemetry module, the ASC-8000 becomes a part of Econolite's Zone Monitor III system specifically designed to implement the many features of the ASC-8000. Time proven communication techniques are combined in the module with extensive status reporting for diagnostics and evaluation of system performance, providing the system owner with the most complete real-time displays capability in the industry.

SYSTEM COMMUNICATIONS

The Telemetry module operates as a transceiver providing communication between the ASC-8000 and KMC-10,000 master. Communication is achieved over voice grade four-wire type 3002 leased line or customer owned cable. Capabilities include: receipt of system commands; readback of intersection status including vehicle, pedestrian, and overlap indications; detector activity; event and alarm conditions; system detector data; and upload/download of entered data.

SPEED DETECTORS

Used for speed monitoring, two system detector pair inputs are used to generate counts for calculating speed based on speed detector distance. The speed data is then read back to the system master for reporting.

SYSTEM I/O INTERFACE

System inputs:

- Eight system detector inputs for volume and occupancy counts.
- Two user defined Alarm inputs allow reporting of special conditions or events.
- External address assignment provides permanently defined and enabled telemetry address.
- Conflict flash input alerts system of a conflict condition.
- Local flash input indicates that intersection has been set to flash.
- Door Open (MAINT REQD) indicates cabinet door open.

System Outputs:

- Four special function outputs provide control of auxiliary functions or equipment on a system wide basis.
- LEDs indicate receipt of carrier, valid data and transmission.

SPECIAL FEATURES

- Keyboard entry of telemetry address or external address assignment.
- Self-diagnostics test major functions and circuits. Test status is displayed.
- Dynamic status display shows system detector inputs, telemetry address, speed calculations, transmit and valid data indicators.



ASC - 8000RM

The ASC-8000RM Advanced System Controller is the culmination of extensive research into customer needs, system applications, and microprocessor based technology, combined with Econolite's 50 plus years of traffic control experience. This research has resulted in a system ready controller with a long list of advanced standard features combined with a programming method so easy to learn that most users can be entering data in less than five minutes with little or no instruction.

The new model ASC-8000RM controller is a NEMA-based direct replacement for the Type 170 controller. The unit is designed for 19-inch EIA rack mounting in the same physical space as the Type 170 and uses identical pin-outs. It may be used to replace a Type 170 in model 330, 332, 336/337 cabinet installations or may be supplied in new cabinet installations designed for Type 170 implementation.

Keyboard programmable controllers have typically been difficult to program in part due to limited display capability and varying keyboard entry sequences. This is especially true of the Type 170 controller. **Not so with the ASC-8000RM.**

Through the use of a multi-line alphanumeric Liquid Crystal Display the ASC-8000RM provides easy to use menu driven programming, traffic engineering terminology prompts, simple cursor control of data entries, and an extensive status display capability.

Easy to use programming and advanced display capabilities are only two of many features of the ASC-8000RM. Features exceeding NEMA TS1-1983 standards, state of the art microprocessor design combined with a 5 year warranty put the ASC-8000RM at the leading edge in traffic technology.

EXPANDED FEATURES

DATA ENTRY

Traffic terminology menus lead the user from a main menu to more specific programming areas: Controller, coordination, preemption, detection, time-of-day programming, telemetry, display, utilities and options. All data is input using numeric and cursor keys and consists of number entries and YES/ON or NO/OFF selections which enable or disable controller functions. Easy to read keys provide both tactile and audio feedback. The 4 line by 40 character LCD display has eight keyboard adjustable contrast settings and E-L backlight providing easy to read displays under all lighting conditions.

MAIN MENU

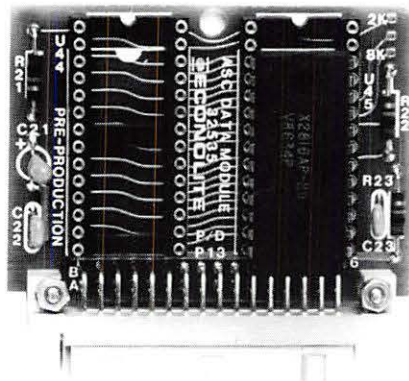
- | | | |
|----------------|--------------|-----------------|
| 1. CONTROLLER | 4. NIC/TOD | 7. STATUS DISP. |
| 2. COORDINATOR | 5. TELEMETRY | 8. UTILITIES |
| 3. PREEMPTOR | 6. DETECTORS | 9. OPTIONS |

CONTROLLER SUBMENU

- | | |
|-----------------|---------------------|
| 1. TIMING DATA | 4. START/FLASH DATA |
| 2. OVERLAP DATA | 5. OPTION DATA |
| 3. RECALL DATA | |

DATA MODULE

One small plug-in module contains intersection configuration, timing, and operation data. The data can be easily transferred from one controller to another. The EEPROM which stores this information retains all data during power or battery failures.



DYNAMIC DISPLAYS

Extensive monitoring capabilities are provided by eight dynamic displays. Overall and specific intersection timing is easily viewed. Displays include error messages which help with fault isolation.

2 MGRN	6 T/N	-T-	-	-	-T-	5% PERM
PCLR	15 VEH	R-	-R-	R-R-	-R-R	NIC-112
6 MGRN	6 PED	-N-	-R-	-N-	-R	
PCLR	15 PRE	/	/	/	/	17:40:55

TERMINAL INTERFACE

Expanded communication capabilities include: Data transfer between ASC-8000RM controllers, printers, and personal computers.

MODULAR DESIGN

Disassembly is simple. Four modules make up the controller: Processor/Display, I/O Interface, Power supply, and Telemetry (optional). All modules may be quickly removed and replaced. Easy access to all modules without the use of extender cards simplifies maintenance.

PROGRAMMING FLEXIBILITY

Engineered to satisfy customer needs, flexible programming gives the user control of many powerful traffic techniques.

- System ready controller with coordination, preemption, and time-of-day included as standard functions.
- Phase sequence allows any combination of up to eight phases, two timing rings and six concurrent groups.
- Expanded detector capabilities include 28 vehicle detector inputs. Sixteen of these inputs are programmable as to phase and function including extend or delay, stop, and calling detectors. Cross switching can be used to apply detector inputs to other phases.
- Guaranteed minimum times for major timing intervals.
- Overlap capabilities include four keyboard programmable standard, protected-permissive, or timed overlaps. The controller can also be configured to provide up to 12 overlaps.
- Five-Section-Left-Turn-Head programming with simple YES and NO selection.
- Soft recall allows selection of rest phases.
- Conditional Service and Reservice allow phase re-timing after normal service.
- Simultaneous Gap Termination for simultaneous phase gap-out in both timing rings.
- Back-up Protection inhibits service of left-turn phases within the same concurrent group for protected-permissive left turns.
- Dynamic Extension of max timers extend the programmed max timer up to a third MAX time based on vehicle demand.
- Dimming is enabled by phase, color, overlap, and time-of-day.
- MUTCD flash operation with keyboard selectable flash phases.
- Provisions for handling Canadian advanced green and early walk indications.

AVAILABLE OPTIONS

- Fiber optic telemetry interface.
- Menu driven diagnostics for component and circuit testing.
- ASC-8000 NEMA shelf-mounted version with standard NEMA interface per TS-1-1983.

COORDINATION

SPECIAL FEATURES

Efficient and flexible coordination techniques are easy to implement with ASC-8000RM programmability.

- 6 cycles, 5 offsets and 4 splits per cycle.
- Automatic calculation of yield and force off points.
- Three permissive periods: Automatic, Dual and Single.
- Three methods for offset correction: Smooth Transition, Add Only Smooth Transition, and Dwell.
- Split demand allows local split selection to handle critical or problem traffic movements.
- Nonactuated or actuated coordinated phase. Dynamic split allows extension of coordinated phase split.
- Coordinated phase selectable per cycle.
- Lead-lag phase sequence selectable per cycle.
- Omit phases on a per cycle or per split basis.
- Recall programmable per cycle.
- Crossing artery split selection for synchronization between main and crossing arteries.
- Sync monitor detects loss of sync and selects NIC® mode as backup.
- Plan commands for multiple zone coordination.
- Coordinator display shows command source, current cycle, offset, split, system and local cycle in percent, commanded and actual offset, offset correction, hold, force-off, permissive, and green band indicators.

CMD-NIC	LOC	CYC 35%	RING 1 2 DIR
CYC-1 90	SYS	CYC 98%	HOLD 1 2
OFT-1	CMD	OFT 50%	F.O.
SPL-2	ACT	OFT 62% ADD	PERM 4 8

NONINTERCONNECTED COORDINATION

Time-of-day programming defines the operation of the NIC® coordination and backup mode.

- Patented time-base provides accurate time and date information. Time drift with power removed is less than 25 ppm (parts per million).
- Automatic daylight savings and leap year adjustment.
- Yearly program with 53 weeks.
- Ten weekly programs to accommodate both normal and seasonal traffic patterns.
- 16 day programs.
- 36 holiday programs override normal day programming. Select date, program number and repeat feature. Repeat allows program to be in effect the following year.
- 160 program steps available for creating day programs. Each step selects starting time, cycle, offset, split and optional selection of flash, max timers, dimming, and control of four special outputs.
- Dynamic status display shows time, date, current program, weekly program, next step and time, current program step, cycle, offset, split, flash, max timer and special functions selected.

18:02:59	3/11/88	MAX SPECIAL
STEP PGM TIME	C/O/S FL DIM	2 3 1 2 3 4
22 1 8:45 1/1/2		X X X
WEEKLY PGM 01	NEXT STEP	7 23:00

MODES OF OPERATION

- Noninterconnected coordination — using time-of-day programming.
- Telemetry — Provides complete systems capabilities.
- Standard, Fixed Time or TM series — Hardwire interconnect.
- Free — Controller operates on its own timing in a fully actuated mode.
- Time-of-day master/local controller — Hardwire interconnect.
- Manual — Manually set any cycle, offset, split or free. Manual commands override other coordinator source inputs.

EXPANDED INPUT / OUTPUT INTERFACE

The standard Type 170 I/O, as supported by the C-1 connector, is not large enough to handle the expanded capabilities of the ASC-8000RM Advanced System Controller. The ASC-8000RM, however, will handle any conventional stand-alone Type 170

application without cabinet modifications. Three additional I/O connectors are provided on the rear of the chassis to permit added systems capabilities.

PREEMPTION

PRIORITY PREEMPTORS

Six priority preemptors allow multiple railroad or emergency vehicle preempt sequences. Priority preemption options include:

- Preemptors can be linked for complex or varied preemption sequences including multiple track clearance phases.
- Preemptors served on priority or nonpriority basis.
- Locking or non locking preemptor call.
- Hold options allow emergency lane green, all red, limited service, or flash conditions.
- Preemptor can override controller timing except during limited service in the Hold interval.
- Pedestrian indicators can be selected as ON, OFF or operational during preemption.
- Overlaps may be terminated at the beginning of preemption.
- Special timers: Duration of preemption sequence, Delay time between receipt of preemptor call and initialization of preemption, Inhibit time to stop normal phase sequencing.
- Easy selection of track clearance, hold and exit phases.
- Selection of calls to be placed after preemption.

BUS PREEMPTORS

Four bus preemptors allow preferential service for bus traffic. Programming options include:

- Reservice time control of repeated preemptor service.
- Delay time between receipt of bus preemptor call and start of preemption sequence.
- Inhibit time stops normal phase sequencing before preemption.
- Preemptor interval times for green, yellow, red, and pedestrian clearance.
- Selection of phases in effect during preemption.
- Direct interface to Opticom high and low priority preempt calls.
- Preemptor dynamic status display shows preemptor timing interval and status plus indications for calls, inhibit, delay and bus reservice timers.

PRIORITY						BUS				PMT 1			
1	2	3	4	5	6	1	2	3	4	PHASE	4	T/C	YEL 2.5
A	D		C				R			PHASE	8	T/C	YEL 2.5
												DURATION 017	

TELEMETRY

SYSTEM APPLICATIONS

Designed for system applications, the ASC-8000RM can be a local or master controller operating in a hardwire interconnected system or part of a non-interconnected time-based system. When equipped with an optional Telemetry module, the ASC-8000RM becomes a part of Econolite's Zone Monitor III system specifically designed to implement the many features of the ASC-8000RM. Time proven communication techniques are combined in the module with extensive status reporting for diagnostics and evaluation of system performance, providing the system owner with the most complete real-time displays capability in the industry.

SYSTEM COMMUNICATIONS

The Telemetry module operates as a transceiver providing communication between the ASC-8000RM and KMC-10,000 master. Communication is achieved over voice grade four-wire type 3002 leased line, or customer owned cable. Capabilities include: receipt of system commands, readback of intersection status including vehicle, pedestrian, and overlap indications, detector activity, event and alarm conditions, system detector data, and upload/download of entered data.

SPEED DETECTORS

Used for speed monitoring, two system detector pair inputs are used to generate counts for calculating speed based on speed detector distance. The speed data is then read back to the system master for reporting.

SYSTEM I/O INTERFACE

System inputs:

- Eight system detector inputs for volume and occupancy counts.
- Two user defined Alarm inputs allow reporting of special conditions or events.
- External address assignment provides permanently defined and enabled telemetry address.
- Conflict flash input alerts system of a conflict condition.
- Local flash input indicates that intersection has been set to flash.
- Door Open (MAINT REQD) indicates cabinet door open.

System Outputs:

- Four special function outputs provide control of auxiliary functions or equipment on a system wide basis.
- LEDs indicate receipt of carrier, valid data and transmission.

SPECIAL FEATURES

- Keyboard entry of telemetry address or external address assignment.
- Self-diagnostics test major functions and circuits. Test status is displayed.
- Dynamic status display shows system detector inputs, telemetry address, speed calculations, transmit and valid data indicators.

KFT 1800 CONTROLLER

STANDARD FEATURES

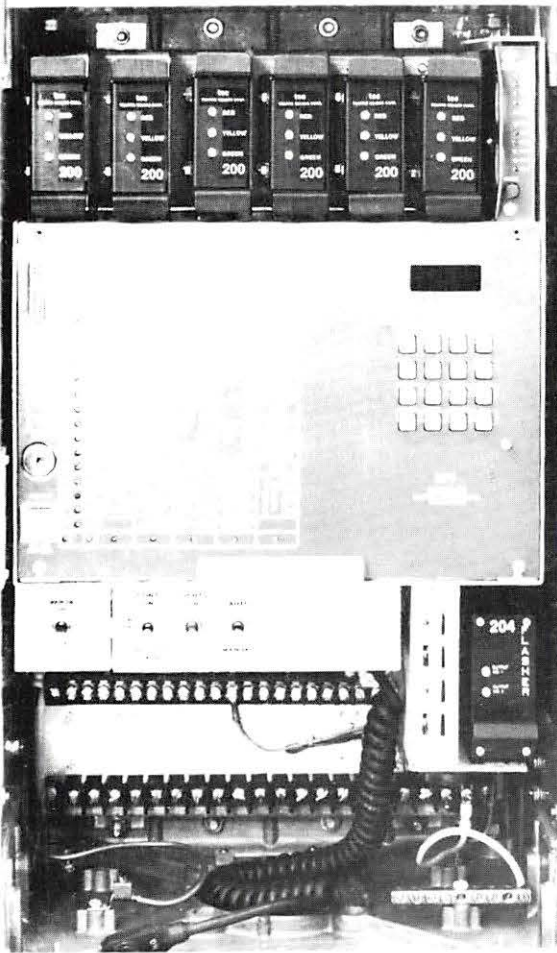
- 4 cycles
- 3 offsets per cycle
- 2 splits per cycle
- 18 signal circuits
- Preemption sequence (railroad)
- Interconnect isolation
- 2-channel vehicle detector
- 2 pedestrian call inputs
- Display of all inputs, outputs, timing values, and parameters
- 6-channel conflict monitor (G/Y/R)

AVAILABLE ADDITIONAL FEATURES

- Manual hand switch and cord
- GFI convenience outlet
- NIC® time clock operation
- Printer interface
- 3M 262 Opticom interface (2 channel)
- Intersection monitor operation
- Zone monitor operation
- KMC-10,000 master operation

KEY ADVANTAGES

- Ready to install assembly
- Easily configured in shop or field
- No software knowledge required
- Simple data-entry procedures
- Uses traffic engineering terminology
- Keyboard entry for signal sequencing and timing
- Uncomplicated maintenance
- Meets applicable NEMA TSI-1983 standards
- Data retained in EEPROM
- Key controlled entry to parameter change
- Access code controlled entry to time change



The KFT-1800 is a self-contained replacement controller assembly designed to retrofit an Econolite (or other manufacturer's) type F electromechanical traffic signal controller. The assembly is designed for new intersections as well as field upgrading of existing intersection installation.

By utilizing the signal group* technique, the controller is easily adapted to your intersection requirements. The 18-signal circuit capacity allows upgrading of most current type F installations, while NEMA-type load switches,

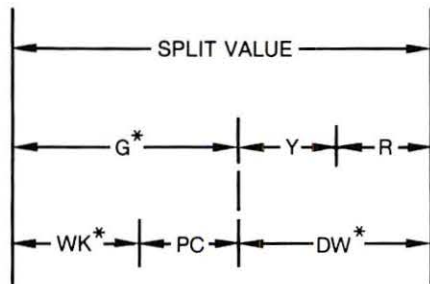
flasher, and flash transfer relays reduce inventory requirements.

All options are provided as simple bolt-on features which may be added at the time of installation or later as the need arises.

Clear and familiar keyboard commands define the controller's phase sequence and time settings. No specific software knowledge is required. Data entry is effected in traffic engineering terminology.

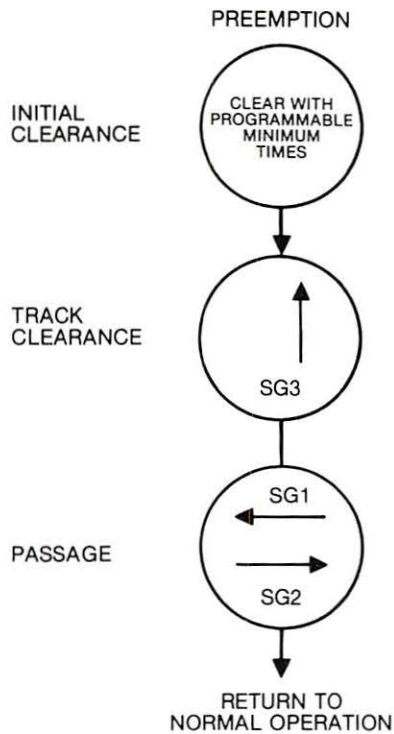
*A signal group is R-Y-G or WK-DW display set.

SIGNAL GROUP TIMING CHART



*AUTOMATICALLY CALCULATED

SIMPLE DATA ENTRY...



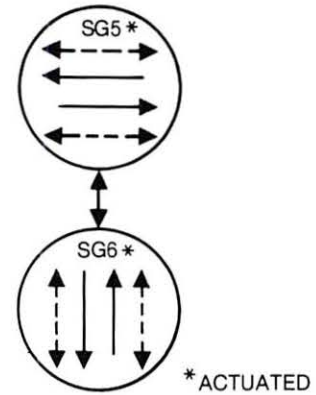
PRIORITY OPERATION CAPABILITY...

OPERATOR KEYBOARD DISPLAY

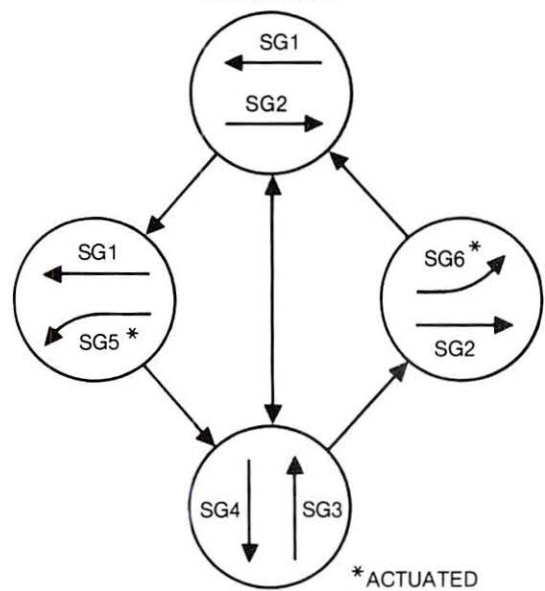
- Dynamic Display of:
 - Internal countdown
 - Cycle countdown
 - Master cycle countdown
 - Correction required countdown
 - Input status
 - Output status
 - Operational status
 - Time of day (with KFT-NIC option)
- Keyboard controlled display/entry of all programmed times/parameters
- Keyboard entry of detector inputs
- Keyboard selection of manual cycle-offset-split
- Keyboard entry of manual sync
- Keyboard entry of signal sequence

EASE OF OPERATION...

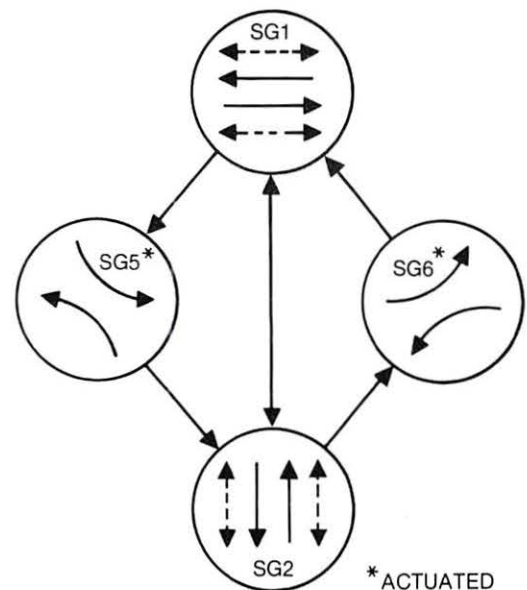
2 PHASE FULLY ACTUATED



4 PHASE VEHICLE LEAD/LAG



4 PHASE ACTUATED LEFT TURNS



FLEXIBILITY OF CONTROL...

KFT-NIC® MODULE

The KFT-NIC® module allows the KFT controller to be coordinated without cable interconnect. The noninterconnected coordinator, known as the NIC®, will allow the controller to function in a system of other controllers with the NICs® using real time as the basis for coordination. The module will keep time with 115 VAC to the accuracy of line

frequency, and without line voltage it will keep time to an error of less than 25 parts per million. The module will allow selection of 4 cycles, 3 offsets, 2 splits, free, and flash.

Programs can be uploaded and downloaded from controller to controller with a download module.

- 90 Program changes — Each allows setting
 - Cycle number 1 through 4
 - Offset number 1 through 3 or free
 - Split number 1 or 2
 - Flash
 - Start hour and minute
- Automatic leap year adjustment
- Portable module is available for downloading and uploading KFT-NIC® information
- Patented cycle resync algorithm to insure quick and accurate reaction to time and cycle changes
- 16 program groups — Any combination of above
- 22 holiday programs — Each contains
 - Effective date
 - Program number to be effective
- Day of week — Seven-day normal program
 - Seven-day seasonal program
- Keyboard selectable cycle resync time
- Daylight savings enable/disable

PRINTER INTERFACE

The printer interface feature in the KFT-NIC® module adds to the KFT controller a convenient method of recording data. A small portable printer or terminal can be interfaced to the printer interface through the PRGM XFER/PRNTR connector. A simple keyboard-entry sequence is used to activate the module which, in turn, outputs a print-out of all keyboard-entered data. This includes all basic KFT controller, configuration, internal and NIC® data.

KFT-TLM MODULE

The KFT-TLM module allows the KFT controller to be interconnected, by telemetry, to the KMC-10,000 on street master. The KFT-TLM module includes all of the features of the

KFT-NIC® module except printer and down load module operation. These functions are provided by the zone monitor.

The KFT-TLM module, designed for reliable communications and simple use, contains the following features:

Message security provided by vertical (word) and horizontal (message) parity.

Addressing Range: 1 to 24

Line Capacity: Maximum number of receivers with respect to line loading (*not* system capacity).

19 local transceivers for leased telephone lines.

25 for customer owned lines.

Local Transceiver

Command Message

System Commands

Cycles 0-6

Offsets 0-5

Splits 1-4

Special functions 0-4

Transmit Message

Intersection Readback

Phase greens 6

Phase detectors 4

Diagnostic readbacks 6

System detectors 8

True speed measurements 2

Channel Specifications

Communications Lines

Unconditioned Type 3002 4-wire leased telephone line or private lines

Line Impedance

600 ohms

Type of Transmission

Frequency shift keyed

Baud Rate

1200 baud

Word Length

8-bits plus odd vertical parity

Channel Message Capacity

25 messages plus one sync word per second

ZONE MONITOR

- Real time intersection display
- Alarm monitoring
- Detector logging
- Data base management
- Report generation
- Simple menu driven operation

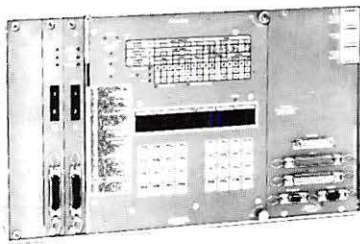


IBM PC-AT OR XT
WITH PRINTER AND MODEM

ARTERIAL MASTER

24 ZONES

INTERSECTION MONITOR®



KMC-10,000



(1 OF 24)

SYSTEM CONTROL

- Traffic responsiveness
- Time-of-day/day-of-week
- Subsystem link-up
- Crossing arterial
- Master/submaster
- Commands
 - 6 cycles
 - 5 offsets
 - 4 splits
 - Special functions
- 24 intersections
- 32 system detectors
- 8 true speed monitors
- 4 speed signs

MONITORS

- Power failure
- Flash
- Cycle failure
- Controller timing
- Detectors
- Alarms

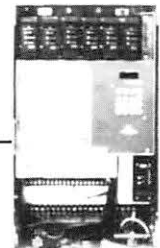
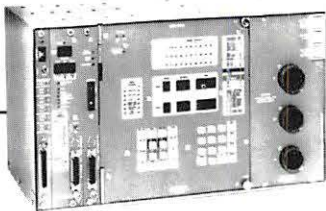
TELEPHONE OR CUSTOMER OWNED LINES

TOTAL
OF 24

KMC-4000/8000

STAND-ALONE TELEMETRY

KFT-1800/2400



- 2-8 phases
- NIC® time base backup
- 5 preemption sequences
- Data base management from zone monitor
- 8 system detectors
- 2 true speed monitors
- Monitors intersection operations

Controls

- Speed sign
- Coordination of non-KMC/KFT controller
- 8 system detectors
- 2 true speed monitors
- Monitors intersection operations

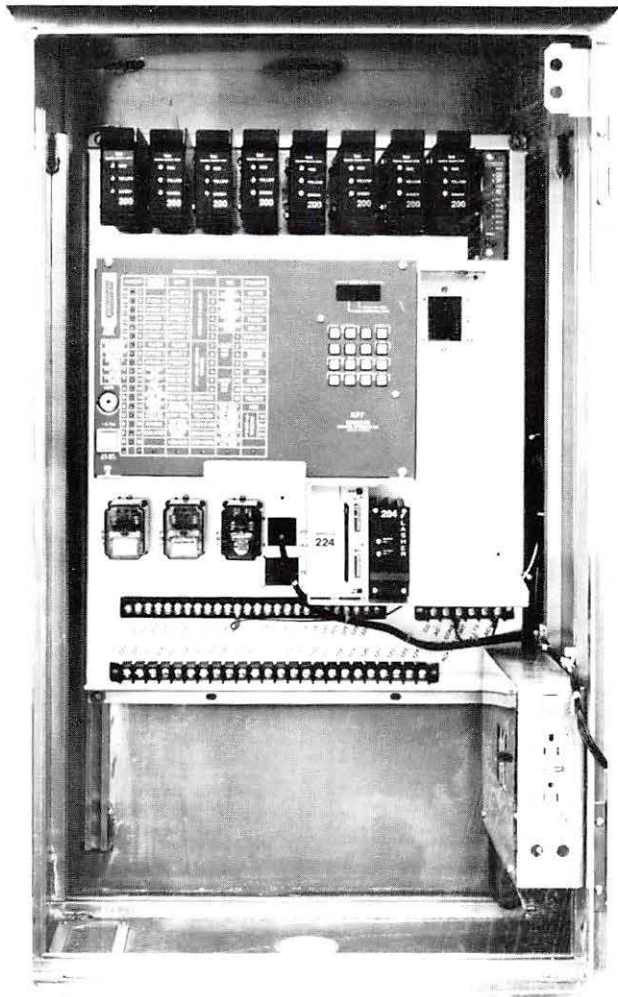
- 18/24 circuits
- NIC® time base backup
- 3 preemption sequences
- Data base management from zone monitor
- 8 system detectors
- 2 true speed monitors
- Monitors intersection operation



ECONOLITE
CONTROL PRODUCTS, INC.

**PN/CTLR-5
PRODUCT
NEWS**

KFT 2400 CONTROLLER



The KFT 2400 is a self-contained controller assembly designed to fit an Econolite (or other manufacturer's) 35" or larger cabinet. The assembly is designed for new intersections as well as easy field upgrading of existing intersection installations.

By utilizing the signal group* technique, the controller is easily adapted to your intersection requirements. The 24-signal circuit capacity allows implementation in most installations, while NEMA-type load switches, flasher, and

STANDARD FEATURES

- 4 cycles
- 3 offsets per cycle
- 2 splits per cycle
- 24 signal circuits
- Preemption sequence (railroad)
- Interconnect isolation
- 2/4-channel vehicle detector
- 2 pedestrian call inputs
- Display of all inputs, outputs, timing values, and parameters
- 6-channel conflict monitor (G/Y/R)

AVAILABLE ADDITIONAL FEATURES

- Manual hand switch and cord
- GFI convenience outlet
- NIC® time clock operation
- Printer interface
- 3M 262 Opticom interface (2 channel)
- Intersection monitor operation
- Zone monitor operation
- KMC-10,000 master operation

KEY ADVANTAGES

- Ready to install assembly
- Easily configured in shop or field
- No software knowledge required
- Simple data-entry procedures
- Uses traffic engineering terminology
- Keyboard entry for signal sequencing and timing
- Uncomplicated maintenance
- Meets applicable NEMA TSI-1983 standards
- Data retained in EEPROM
- Key controlled entry to parameter change
- Access code controlled entry to time change

flash transfer relays reduce inventory requirements.

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Clear and familiar keyboard commands define the controller's phase sequence and time settings. No specific software knowledge is required. Data entry is effected in traffic engineering terminology.

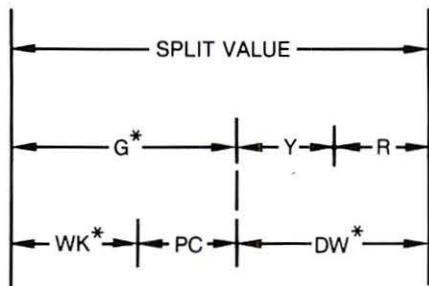
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ECONOLITE
CONTROL PRODUCTS, INC.

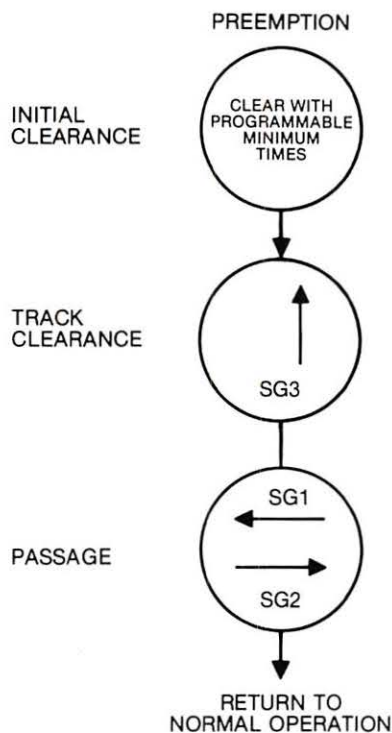
3360 E. LA PALMA, P.O. BOX 6150, ANAHEIM, CALIFORNIA 92806

SIGNAL GROUP TIMING CHART



*AUTOMATICALLY CALCULATED

SIMPLE DATA ENTRY...



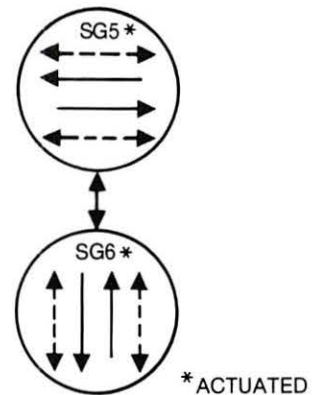
PRIORITY OPERATION CAPABILITY...

OPERATOR KEYBOARD DISPLAY

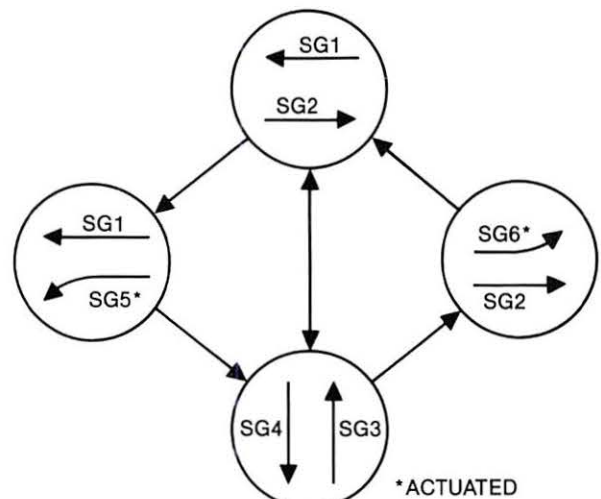
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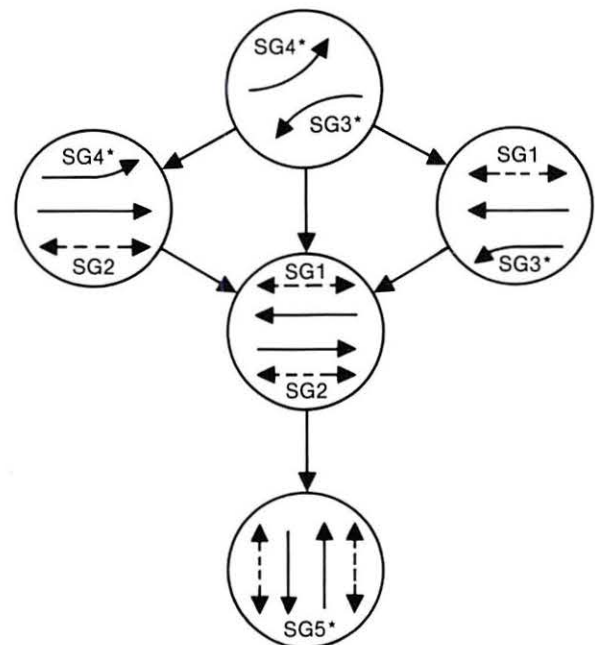
2 PHASE FULLY ACTUATED



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5 PHASE ACTUATED LEFT TURNS AND CROSS STREET



FLEXIBILITY OF CONTROL...

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25 for customer owned lines.

Local Transceiver

Command Message

System Commands

Cycles 0-6

Offsets 0-5

Splits 1-4

Special functions 0-4

Transmit Message

Intersection Readback

Phase greens 6

Phase detectors 4

Diagnostic readbacks 6

System detectors 8

True speed measurements 2

Channel Specifications

Communications Lines

Unconditioned Type 3002 4-wire leased telephone line or private lines

Line Impedance

600 ohms

Type of Transmission

Frequency shift keyed

Baud Rate

1200 baud

Word Length

8-bits plus odd vertical parity

Channel Message Capacity

25 messages plus one sync word per second

ZONE MONITOR

- Real time intersection display
- Alarm monitoring
- Detector logging
- Data base management
- Report generation
- Simple menu driven operation

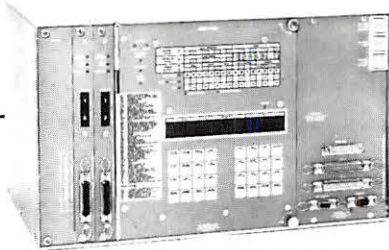


IBM PC-AT OR XT
WITH PRINTER AND MODEM

TELEPHONE
NETWORK

24 ZONES

ARTERIAL MASTER



KMC-10,000

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- Time-of-day/day-of-week
- Subsystem link-up
- Crossing arterial
- Master/submaster
- Commands
 - 6 cycles
 - 5 offsets
 - 4 splits
 - Special functions

- 24 intersections
- 32 system detectors
- 8 true speed monitors
- 4 speed signs

INTERSECTION MONITOR®



(1 OF 24)

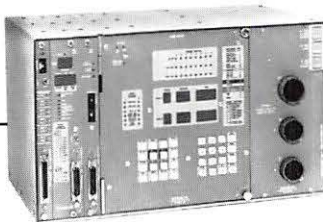
MONITORS

- Power failure
- Flash
- Cycle failure
- Controller timing
- Detectors
- Alarms

TELEPHONE OR CUSTOMER OWNED LINES

TOTAL
OF 24

KMC-4000/8000



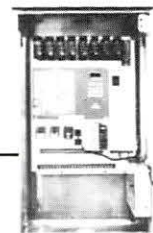
- 2-8 phases
- NIC® time base backup
- 5 preemption sequences
- Data base management from zone monitor
- 8 system detectors
- 2 true speed monitors
- Monitors intersection operations

STAND-ALONE
TELEMETRY



- Controls
- Speed sign
 - Coordination of non-KMC/KFT controller
 - 8 system detectors
 - 2 true speed monitors
 - Monitors intersection operations

KFT-1800/2400



- 18/24 circuits
- NIC® time base backup
- 3 preemption sequences
- Data base management from zone monitor
- 8 system detectors
- 2 true speed monitors
- Monitors intersection operation

ASC/2 CONTROLLERS

Description	Part Number		
	-1000	-2000	-2100
Telemetry module (FSK)	32825G1	32825G1	32825G1
Telemetry module (RS-232)	33525G1	33525G1	33525G1
Overlap card	---	---	31775G1
Enclosure	32809G1	32809G1	32809G1
I/O interface module	32855G1	32810G1	32810G1
Exp. I/O interface module - Type II	---	---	33525G1
Power supply module	32815G1	32815G1	32815G1
Processor module*	32805G1	32805G1	32805G1
Battery, 3 V lithium	32897P1	32897P1	32897P1
Liquid crystal display module	32526P3	32526P3	32526P3
Data module - not programmed	32845G1	32845G1	32845G1
Display Panel with keyboard	32834G1	32834G1	32834G1

*Does not include controller software

ASC/2 CONNECTING CABLES

Description	Part Number
Cable A	32649G1
Cable B	32649G2
Cable C	32649G3
9-pin telemetry cable	44982G1
Telemetry cable	31690G10
D Interface cable	32231G60
Modem cable	32162P2
Terminal cable	32162P3

CTLR-2

ASC-8000

Description	Part Number
ASC telemetry module	32520G1
Overlap card	31775G1
Enclosure with transformer & filter capacitors	32501G1
I/O interface module	32505G1
Power supply module	32515G1
Display/panel assembly	32540G1
32540G1 display/panel module consists of:	
Liquid crystal display module	32526G1
Keyboard display panel (no electronics)	32514G1
Processor/display module*	32510G1
Data module (not programmed)	32535G1
Battery, 3.7 V lithium	31585P2

*Does not include controller software

ASC-8000 CONNECTING CABLES

Description	Part Number
Cable A	32649G1
Cable B	32649G2
Cable C	32649G3
ASC to Modem	32162G2
ASC to ASC (RS-232) for downloading	32162G6
Adaptor cable to install an ASC-8000 controller into a cabinet wired for KMCE series controller with preemption and coordination modules	32550G1
Telemetry cable	31690G10
D Interface cable	32231G60

KFT-1800/2400

Description	Part Number
Down load module	31860G2
Controller only, local, with front panel	32100G101
Controller only, master, with front panel	32100G102
Front panel for controller	32119P4
NIC module	32200G1
CMU module for KFT-1800 with red monitor	32220G1
CMU module for KFT-2400 with red monitor	32225G1
Telemetry/NIC module	32400G1
Modified program card KFT-18 circuit CMU	32260G1
Modified program card KFT-24 circuit CMU	32226G1
KFT-1800 ped transformer	32111G1
KFT Master Controller with NIC without panel	32103G2
KFT Master Controller with NIC with front panel	32103G102
24" aluminum cabinet for KFT-1800	24A-1800*

*Specify color when ordering

NOTE: Master controller includes 32200G1 NIC module.

KFT18/24 CONNECTING CABLE

Description	Part Number
KFT to Telemetry Interface board	31690G11

CTLR-4

KMCE-8000

Description	Part Number
Enclosure, expanded — Consult factory	31901G1
Connector I/O panel — Consult factory	31702G3
Keyboard/display — Consult factory	31725G102
Power supply — Consult factory	31735G1
I/O interface — Consult factory	31715G3
Processor with main program and standard configuration PROMs unless otherwise specified — Consult factory	31730G1
Battery, 6V	31395P1
Battery, 2V lithium	31585P1
Telemetry module with speed trap - consult factory	31845G2
Preemption module - consult factory	31890G1
NIC Coordination module - consult factory	31940G2
Down-load module - consult factory	31860G1

KMCE-8000 CONNECTING CABLES

Description	Part Number
Cable A for KMCE-8000	32649G1
Cable B for KMCE-8000	32649G2
Cable C for KMCE-8000	32649G3
Telemetry module cable	31690G10
Preemptor module cable	31780G1
NIC coordination module cable	31686G2

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ZONE MONITOR IV

Traffic Surveillance & Data Management

OVERVIEW

Zone Monitor IV is a powerful traffic management program for IBM personal computers and compatibles. In combination with the right hardware, it can provide distributed data base management and surveillance for traffic systems with up to 5,760 intersections. It is available for a single computer or a LAN, and in many cases it can replace a much larger, more expensive central system.

The program, which represents years of development and field application, is exceptionally easy to learn and to use. It is menu-driven, with clear explanations on the menu screens. Dynamic color-graphic displays of individual intersections or entire zones aid in traffic optimization. Clear diagnostic messages and reports aid in traffic system maintenance.

Zone Monitor IV pays for itself many times over through more efficient traffic flow, better utilization of existing traffic facilities, reduced downtime, and savings in labor.

1. Coordinated signals

The benefits are fewer stops, reduced delays, decreased travel time and reduced pollution. This is achieved through better timing of traffic signals in response to measured traffic demand.

Capabilities of Zone Monitor IV include the real-time, remote monitoring of traffic flow, the uploading/downloading of intersection controller and zone master data base files, and the time synchronization of all traffic equipment in the field.

Zone Monitor IV includes a software interface to the well-known McTrans PASSER-II and TRANSYT-7F arterial traffic programs, which both produce optimal signal timing designs in terms of cycle length, splits and offsets.



2. Reduced downtime

Zone Monitor IV provides on-line equipment diagnostics with hard copy printouts. These allow maintenance personnel to be dispatched at the earliest opportunity, thereby assuring traffic safety and avoiding delays. The computer can call the various traffic zones according to a preprogrammed schedule or receive prioritized telephone calls which signify an equipment malfunction.

3. Reduced labor costs

With Zone Monitor IV software, operators at a central site can monitor traffic flow, diagnose equipment in the field, synchronize equipment, log data for analysis, and download improved controller data bases to optimize traffic flow. This avoids the time and expense for personnel to travel into the field, except for maintenance purposes. Capabilities of Zone Monitor IV include the uploading, comparing, editing and downloading of zone master and controller data bases.

4. Improved reliability

Compared to central computer systems like UTCS, the Econolite Zone Monitor IV network is a distributed system which maintains coordination in case the central computer, or the communications to it, should fail. Coordination is assured by field-mounted KMC-10,000 Zone Masters, which communicate once per second via telemetry with all traffic controllers in their zone.



Main menu screen

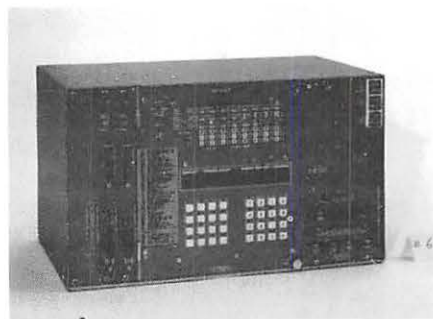
SYSTEM HARDWARE

1. Computer system

The minimum recommended host system consists of an AT-class (286) computer with 512 KB of RAM, a floppy disk drive, a 20 MB hard disk, an EGA or VGA color screen, a mouse, a 1200 bps Hayes-compatible modem, and an 80-column printer for hard copy reports. Econolite will be pleased to furnish the required computer system.

For larger installations, the single computer may be replaced by a LAN system, which allows users on multiple PCs to access common data base files, graphically view different intersections and zones on multiple computer screens, and upload and download data bases. The LAN assures that users always have access to the latest files, yet provides a high degree of control by only allowing a single user to modify a file at any one time.

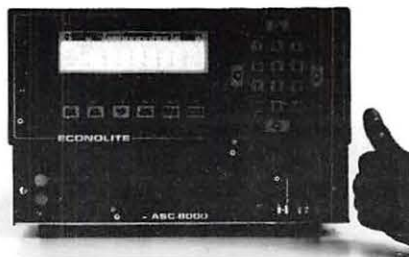
Zone Monitor IV has been designed to work with any PC-based LAN operating system, such as Novell. Installation from floppy disks requires that the LAN already be in place; however, Econolite will be pleased to furnish the entire LAN system, including hardware, installation and training.



2. KMC-10,000 Zone Master

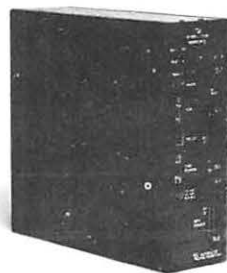
Coordination of intersections is performed by KMC-10,000 Zone Masters, each controlling a zone. Each master can perform time-of-day or traffic-responsive control for up to 24 intersections. In addition, it can collect volume and occupancy data from up to 32 sampling detectors and determine speed from up to 8 speed traps.

By early 1991, over 800 KMC-10,000's had already been installed. With Zone Monitor IV, all masters already in the field can easily be made part of distributed traffic systems with monitoring and control from a central office.



3. Traffic controllers

Coordination of intersections requires the use of Econolite ASC-8000, KMC-8000 or KFT controllers, which can be mixed in any combination. When communicating via a KMC-10,000 master, the Zone Monitor IV computer (or LAN) can display intersection operation in real time as well as the operating status and data base of any controller. It can also download data bases to program any of the controllers. In the absence of a KMC-10,000 master, isolated ASC-8000 controllers can communicate directly with the Zone Monitor IV computer via modem.



4. Intersection Monitor II

Any type of controller, whether NEMA, Type 170, pretimed or electromechanical, can be monitored (but not coordinated) by Intersection Monitor II. This compact unit fits inside the traffic cabinet and senses cabinet operation via physical connections or via telemetry (if available). It monitors cycle failures, flasher failures, controller timing, the status of up to 32 detectors, the status of the CMU, and volume counts based on detector data. Like the KMC-10,000, it supports real-time graphics, and it can initiate outgoing calls on a priority basis to report events consisting of field failures or status changes. It can also upload stored event and detector log data when called.

5. Communications, master to intersection

Communications between the KMC-10,000 Zone Master and the controllers in its zone is normally via dedicated TDM/FSK telemetry lines at 1200 bps. Each KMC-10,000 provides two telemetry channels, which jointly support a total of 24 controllers in addressable, multi-drop fashion. Physically, each telemetry channel consists of two twisted pairs of copper wire. The controllers require the telemetry module option.

As an alternative, the copper wire may be replaced by fiberoptic cables. These provide total immunity to RFI, EMI and lightning surges, total electrical isolation, freedom from ground loops, and high bandwidth for future signal expansion. Each controller requires an RS-232 telemetry module option plus a Fiberoptic Interface Panel with two RS-232-to-fiber modems. This hardware allows up to 24 controllers to be daisy-chained from intersection to intersection with up to 2 km (1.25 miles) between cabinets. Branching is also supported.

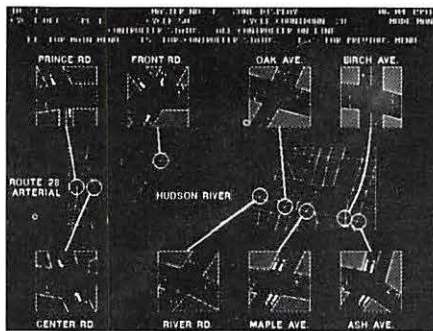
A second alternative is to use radio interconnect, which avoids the installation costs and right-of-way problems associated with any type of cabling.

6. Communications, computer to master

Communications between the computer or LAN running Zone Monitor IV and the equipment in the field is normally via commercial dial-up telephone lines. An external Hayes-compatible 1200 or 2400 bps modem is required for each KMC-10,000 master and each isolated ASC-8000 controller. Intersection Monitor II includes a built-in 1200 bps modem.

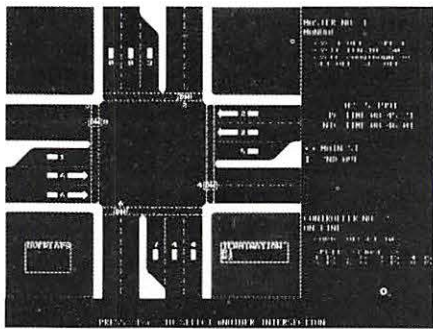
As an alternative to leased telephone lines, Zone Monitor IV supports the direct connection of KMC-10,000 Zone Masters over private lines at 2400 bps with electronic line switching by an external data port selector. The copper wiring may be replaced by fiberoptic cables with an RS-232-to-fiber modem at each end. All required direct-connect hardware is available from Econolite and, depending on the situation, can reduce overall system operating costs compared to leased telephone lines.

GRAPHIC DISPLAYS & OPTIMIZATION UTILITIES



1. Zone map display

This dynamic color display provides a plan view of the up to 24 intersections and 32 system detectors in a single zone, with text labeling of all major features. Real-time components of the display include major movement greens and reds for all intersections as well as the actuation status of all system detectors. Text shows whether an intersection is on-line, free, has a coordination fault, is in preemption or flash, or has a telemetry failure. The map may be user generated with any paint, draw, CAD or scanner program capable of saving files in the PCX format.

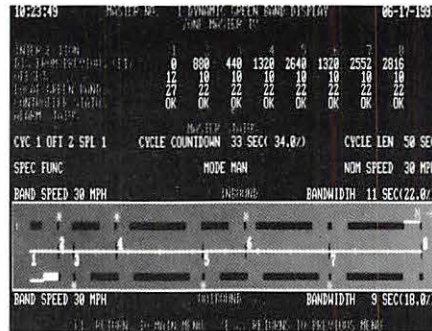


2. Intersection display

This dynamic color display shows the real-time operation of a single intersection, including complex multi-legged configurations and diamonds. The display includes the traffic and pedestrian signal colors for each active phase, vehicle and pedestrian actuations, and the traffic plan in effect (cycle, offset, split). The intersection display may be user-generated, or it may be based on any of nine PCX templates shipped with Zone Monitor IV for EGA (640 x 350) or VGA (640 x 480) screens.

3. Green band display

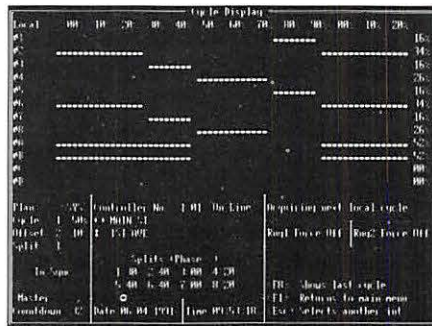
This real-time, patented display presents a one-second time slice from the time-



space diagram for up to 8 of the possible 24 intersections per zone. It allows the traffic engineer to see the results of various zone coordination strategies and to fine-tune the system.

The green bands move from right to left (top graph) or left to right (bottom graph) to indicate inbound/outbound traffic flow. Dark green identifies the through-band. If a signal restricts this band, a star appears to indicate an out-of-band state. If a signal is green outside of the through-band, the additional portion of the green band is shown in light green (local-green). A white underline references the through-band generated by the first intersection. Traffic signals and system detectors are displayed as changing colored marks.

User inputs include the distance between intersections and progression speed, which may vary from intersection to intersection. As an aid to system optimization, Zone Monitor IV includes a system max command, which forces ASC-8000 controllers to maximum split use.

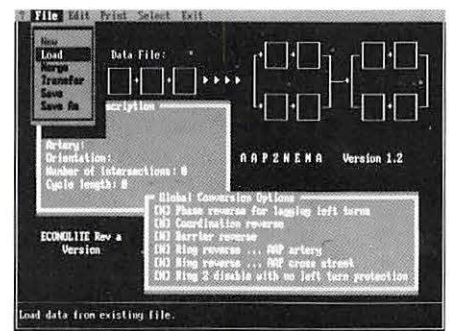


4. Split-timing cycle display

This diagram allows the on-line observation of split usage at any intersection and comparison of actual versus programmed splits. It shows the real-time status (R, Y, G) of each phase and overlap for a specific controller in the form of time lines moving from left to right. There can

be 12 lines, corresponding to 8 phases and 4 overlaps. The horizontal axis covers one cycle period and is labeled in percent of cycle as measured from local zero (master zero plus offset). To the right of each time line is the actual percent of green plus yellow for the most recent full cycle.

UTILITY PROGRAMS



1. AAP to NEMA software

Zone Monitor IV includes a software interface to the McTrans AAP2NEMA utility program to avoid the manual entry of computed timing plans. AAP2NEMA converts the output from the McTrans Arterial Analysis Package (AAP) into the familiar eight-phase, dual-ring concurrent format of NEMA controllers. AAP (available directly from McTrans) includes the well-known PASSER-II and TRANSYT-7F arterial traffic programs, which both produce optimal signal timing designs in terms of cycle length, splits and offsets.

2. Detector Data Converter

The DECON program converts the binary coded detector log volume files from KMC-10,000's and Intersection Monitor II's into ASCII. This makes the files suitable for importing into external data base or spreadsheet programs for further analysis or manipulation.

3. EPROM capability

Zone Monitor IV provides easy, menu-type programming to make configuration EPROMs for the KMC-10,000 Zone Master and KMC-8000 intersection controller. These are used as second-level backups for the battery-backed RAM. An optional PROM burner with an RS-232 interface is required.

SYSTEM PRINTOUTS & DATA BASE MANAGEMENT

Zone Monitor IV offers a comprehensive set printouts with matching screen displays to monitor system status and analyze performance. These may be initiated by external events, by manual commands, or according to schedule. Setup is via simple menu selections.

1. Event log & failure reports

In the monitor mode of operation, the computer responds to telephone calls from KMC-10,000 Zone Masters and Intersection Monitor II's in the field to receive event reports. These include prioritized failure diagnostics of zone masters, intersection controllers, detectors, speed traps and telemetry channels. Included also are program and mode changes resulting from traffic-responsive plan computations, time-of-day scheduling, or external commands.

In monitor mode, events are displayed on the screen and are printed out as received. The data is also stored on disk for later recall in event reports. Menu selections and file search capability allow printouts for any combination of date, event type and system device.

If the computer is not in monitor mode to receive phone calls, the most recent events are automatically stored in each KMC-10,000 master (up to 255 events) and Intersection Monitor II (100 events). Both units will call in automatically at programmed time intervals looking for the computer to respond. Stored events can also be recalled manually or according to schedule.

2. Status report

Upon manual command or according to schedule, the computer can poll any or all KMC-10,000 Zone Masters and print a report on the operation of each zone:

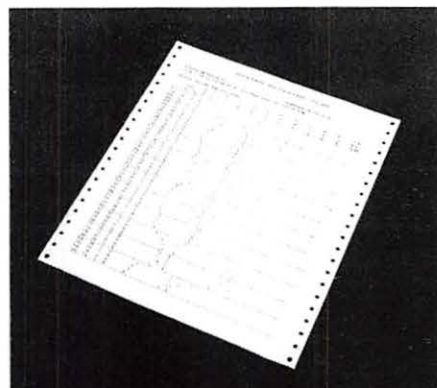
- Computed level of traffic
- Computed traffic-responsive program (cycle, offset, split)
- Program in effect and source (manual, time-of-day, traffic-responsive)
- On-line/off-line or failure status of all controllers, telemetry channels, system detectors, local detectors, speed traps, special function outputs and speed sign outputs.

The computer can also poll all Intersection Monitor II's for the operating status of field equipment.

3. Detector logs & plots

System detector data is automatically collected and stored by all KMC-10,000's at 15, 30 or 60 minute log intervals. This data can be transferred to the computer upon manual command or automatically according to schedule every 6, 12 or 24 hours. There it is stored on hard disk and can be printed out for traffic analysis and system optimization:

- **The system detector log** shows volume, occupancy and computed average speed over a time interval specified by the operator. Volume is the number of vehicle counts accumulated over the interval. Occupancy is the percentage of time during which vehicle presence was detected. Speed is expressed directly in mph or kph.



- **The detector plot** prints out the equivalent of a strip chart for volume, occupancy and computed average speed. The letters V, O and S are positioned on the horizontal axis to indicate magnitude. Each row represents a new time interval and is labeled by time of day.
- **The speed log** counts vehicles in 3 speed bands from up to 8 speed traps. The high and low thresholds to define each set of speed bands can be input directly in mph or kph, or they can be input as deviations from a nominal progression speed computed for a specific cycle and offset.

System detector data is also collected by the Intersection Monitor II's and can be output in the form of a system detector log and a detector plot for volume.

4. Split monitor report

This KMC-10,000 report provides the operator with a comparison of actual vs. programmed split percentages for each phase of an ASC-8000 controller during the preceding cycle. A negative number indicates that the phase terminated prior to being forced off; a positive number indicates that the phase started early.

DATA BASE MANAGEMENT

All controllers and zone masters can be programmed locally in the field or from the central computer. Zone Monitor IV incorporates a set of utilities which assure the error-free uploading/downloading of data bases as well as data base storage and comparison. Many features have been incorporated to make the system user-friendly and automatic while providing a high level of security.

- **The upload/download mode** automatically transfers data bases from/to the KMC-10,000, Intersection Monitor II, KMC-8000, ASC-8000 or KFT controllers. All programming options are menu-driven and in traffic engineering terminology. Operator entries primarily consist of simple yes/no, on/off or numerical value selections. Features also include the automatic comparison of data bases, data base printouts, and backup to floppy disk.
- **Zone and intersection directories** are provided to quickly locate zone masters and intersections. These may be labeled by name or number for easy identification in screen displays and reports. Telephone numbers are shown for all KMC-10,000 masters, Intersection Monitor II's and isolated ASC-8000 controllers.
- **Data security** is assured by a separate upload/download access code for each zone and by user passwords with three levels of access:

Supervisor for access code number assignment and data base changes

Data Change for data base change

Viewer for viewing only.

LAN CAPABILITY

The LAN (Local Area Network) version of Zone Monitor IV allows multiple users on multiple computers to access the common data base files on the server, to view different intersections and zones, and to upload or download data bases. The computers may be in different rooms or buildings to serve different departments. Normally each workstation has its own printer to generate reports, its own modem for communication with the traffic equipment in the field, and its own telephone number.

As opposed to an installation with non-networked, multiple stand-alone computers, the Zone Monitor IV LAN assures that users can access common files, which are always up-to-date. It also provides a high degree of file security by only allowing a single user to modify a file at any one time. Any file being worked on is automatically marked as LOCKED for all other attempts at modification. However, any number of workstations may view the same file at the same time.

There are three types of computers on the LAN. In addition, a separate maintenance computer may be called by the field equipment.

1. The file server computer.

This computer operates the LAN network and stores all program and data files on a single large hard disk, which is accessible to all workstations. The server is not used as an interactive workstation so as not to jeopardize the smooth running of the LAN.

2. The monitor workstation.

One workstation computer is dedicated to operate in **monitor mode**. This assures unrestricted access to the event and detector log files within the LAN, so that these files can be continually updated. Only the monitor workstation can perform the following:

- Wait for KMC-10,000 Zone Masters and for Intersection Monitor II's to call in with event reports and detector logs.
- Scan a preprogrammed event/log schedule on a continual basis to initiate outgoing calls to receive event reports and detector logs.
- Scan a preprogrammed schedule for automatic system status reports, comparison of controller and data base files, and download of controller data base files.

- Make manual outgoing calls to receive event reports and detector logs.
- Update event and detector log files on disk.

3. Normal workstations.

These computers can perform all functions of the stand-alone Zone Monitor IV computer, except operate in monitor mode. Specifically, they can graphically display different intersections and zones, upload, download and manage data bases, and generate reports.

4. Maintenance computer

In addition to the computers in the LAN, a separate maintenance computer is often located in the service shop. This computer is left to run in unattended monitor mode waiting for incoming calls which signal a malfunction. The KMC-10,000 Zone Masters and Intersection Monitor II's can each be programmed to direct maintenance-related calls to the separate telephone number of the maintenance computer.

KMC-10,000 ZONE MASTER

External interfaces

- 24 intersection controllers (via telemetry)
- 32 system detectors (volume, occupancy, calculated speed)
- 8 speed trap monitors
- 4 BCD speed sign outputs
- 4 special function ON/OFF outputs
- RS-232 port (to modem, laptop computer or local printer)

Traffic control modes

- Master or slave operation
- Traffic-responsive coordination
- Time-of-day, day-of-week coordination
- 6 cycles, 5 offsets, 4 splits
- Crossing arterial synchronization
- Zone plan command for up to 32 user-determined plans per controller
- Manual command
- System free command
- Local free command (by intersection)

- System flash command
- Local flash command (by intersection)

Surveillance & diagnostics

- System detectors (no activity, excessive counts, max presence, min presence)
- Speed traps (no activity)
- Intersection operation (cycle failure, coordination error, etc.)
- Telemetry channels (no response, loop failure, etc.)
- Local storage of up to 255 events

Programming modes

- Via Zone Monitor IV central computer
- Via local laptop computer
- Via front panel

INTERSECTION MONITOR II

External interfaces

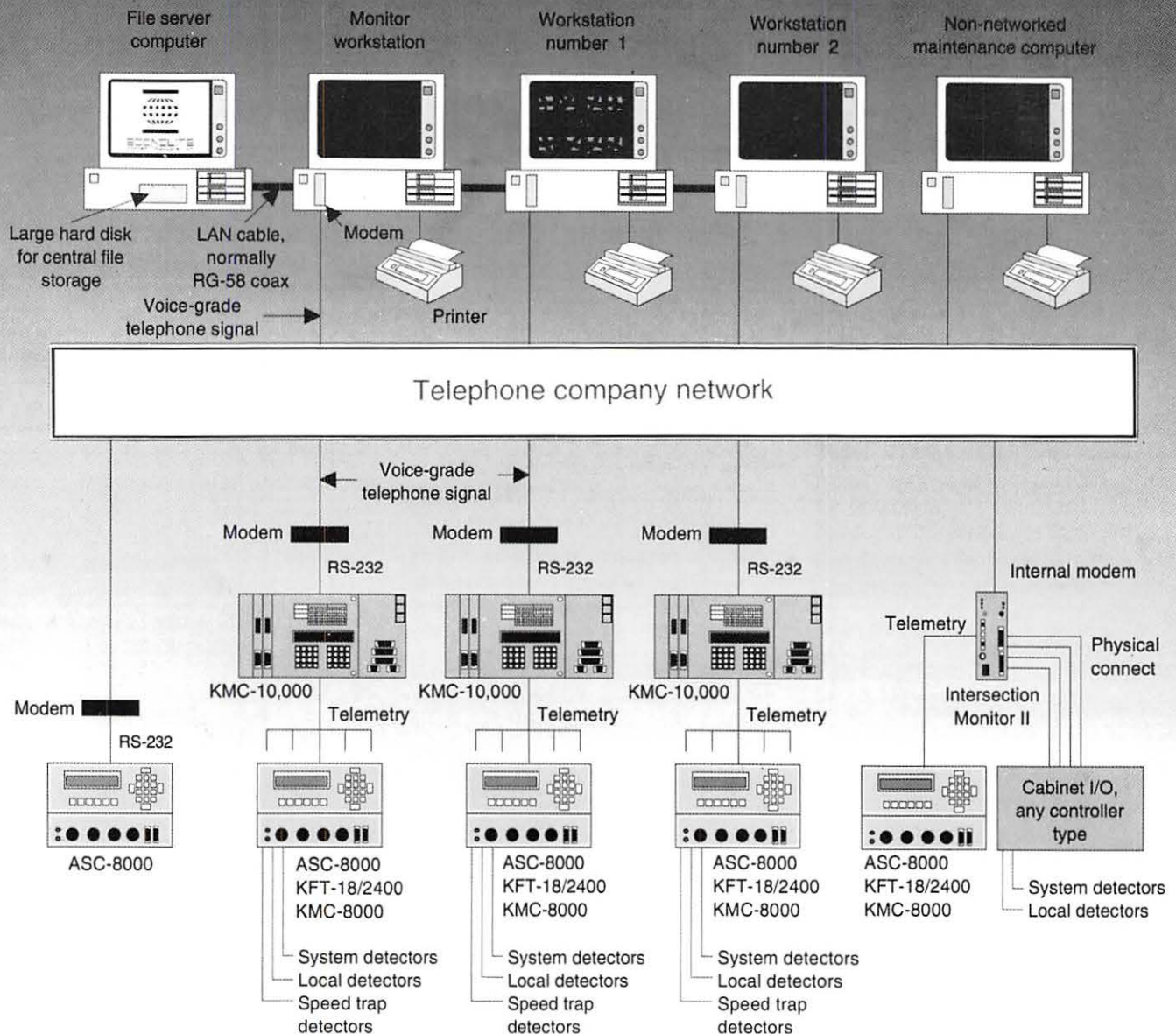
- Physical connection to I/O of all controller types

- Telemetry (optional) to Econolite controllers.
- Built-in 1200 bps modem for communication to Zone Monitor IV computer.

Failure reporting & logging

- Detector failure (up to 32 detectors, no activity, max presence)
- Power failure after the event
- Power failure during the event (requires standby power option)
- Intersection flash
- Flasher failure
- Cycle failure
- Controller timing (min green, max green, min clearance)
- Time check failure
- Six user-designated alarm inputs
- Detector count logging (15 min intervals)
- Automatic or manual detector recall
- Local storage of up to 100 events

ZONE MONITOR IV LAN SYSTEM



SYSTEM OVERVIEW

- Up to 240 control zones per Zone Monitor IV stand-alone system or LAN.
- One KMC-10,000 per zone with up to 24 ASC-8000, KFT-18/2400 or KMC-8000 controllers.
- Up to 24 ASC-8000 isolated intersection controllers per zone with connection via modem.
- Up to 24 Intersection Monitor II's per zone with connection via built-in modem. Each Intersection Monitor (I or II) can monitor one controller cabinet via physical connections regardless of the type of controller. It can also monitor Econolite controllers via telemetry.
- The telephone company network to the KMC-10,000 masters may be replaced by private lines (RS-232, RS-422, RS-485 or fiberoptics) with switching by an external data port selector.
- The zone telemetry lines may be replaced by fiberoptics.



ECONOLITE
CONTROL PRODUCTS, INC.

3360 E. La Palma, Anaheim, California 92806-2856
P.O. Box 6150, Anaheim, California 92816-0150
Telephone: (714) 630-3700 FAX: (714) 630-6349



ECONOLITE
CONTROL PRODUCTS, INC.

PN/SYS-2 PRODUCT NEWS

- Complete intersection surveillance
 - Power failure – INTERSECTION MONITOR II features an option for a priority 1 power fail event. This capability allows the unit to report a local power failure during the power outage. To use this feature, a secondary power source (SPS) is required.
 - Flash
 - Controller timing
 - Cycle failure
 - Detector failure
 - Status alarms
- Failures automatically reported and stored on disk
- Manual and automatic control of detector recall and force-offs
- Real-time graphics display of intersection operation and status including detector, pedestrian, and overlap operation with customer-generated EGA-VGA intersection colorgraphics
- Remote database management for up to 5760 INTERSECTION MONITORS
- Prioritized events and alarms with user-defined event capabilities
- Remote logging and plotting of up to 32 intersection detectors
- Menu-driven software with high-speed user access for easy learning and operation
- Full compatibility with ZONE MONITOR IV system operation
- Fully telephone company compatible with internal high-speed, 1200 bps modem



- Front-panel controlled telephone "ring" signal for use with lap-top computer
- Complete local intersection controller database upload and download when used with telemetry-installed Econolite controllers
- Easily-installed "upgrade kit" available to convert Econolite's INTERSECTION MONITOR to INTERSECTION MONITOR II

Intersection Monitor II™

INTERSECTION MONITOR II is the second in a series of telephone dial-up, stand-alone, traffic signal intersection supervising devices. It is an element of ZONE MONITOR IV and, as part of this cost-effective surveillance and monitoring system, can be used to supervise one of 5760 intersections within the ZONE MONITOR IV system.

INTERSECTION MONITOR II may be installed with ANY controller configuration – NEMA, Type 170, pretimed and even pre-NEMA and electromechanical controllers. It will supervise system-interconnected, remote or isolated intersections in any configuration with only standard dial-up telephone service required for communications.

INTERSECTION MONITOR II, along with its IBM-compatible PC based ZONE MONITOR IV System, provides extensive intersection surveillance and control functions previously found only in expensive, interconnected central computer-based systems.

INTERSECTION MONITOR II, if used with Econolite ASC-8000, KMCE-8000, or KFT controllers with telemetry, will also upload and download the complete controller data base and will provide NIC time control.

IBM-PC WITH
PRINTER AND MODEM



THE INTERSECTION MONITOR SYSTEM

STANDARD DIAL-UP
TELEPHONE NETWORK

INTERSECTION
MONITOR

INTERSECTION
MONITOR

UP TO 24 INTERSECTIONS PER ZONE

Zone Monitor IV Features

- Receives and stores on hard disk all event/alarm reports and detector logs for up to 32 intersection detectors per INTERSECTION MONITOR II.
- Provides for printing alarm and event reports and logs stored on hard disk with a user-programmable report generator for specific alarm and event tracking.

■ INTERSECTION MONITOR II Data Base Management

- Data entry and storage on hard disk
- Upload and download of INTERSECTION MONITOR II data base
- Capability to print all entered data
- Capability to compare data on file to data uploaded
- Copy data from one INTERSECTION MONITOR II to another

■ LOCAL CONTROLLER Data Base Management

If INTERSECTION MONITOR II is installed at an intersection with an Econolite controller that has telemetry, the complete controller data base may be uploaded and downloaded through Zone Monitor IV. This allows complete modification of the intersection operation, including all timing intervals, coordination time-base and preemption operation, as governed by Zone Monitor IV capabilities. Local controller NIC time-base may also be resynched through INTERSECTION MONITOR II. (Local controller must be ASC-8000, KMCE-8000, or KFT with telemetry.)

- Allows the user to generate a real-time graphics display of the intersection operation and status, including detectors, pedestrian, and overlap operation with customer-generated EGA-VGA intersection colorgraphics. Special intersection geometry in virtually any configuration may be realistically displayed.
- Capability to plot logged detector data for up to 32 intersection detectors.
- Provides for operator control of special function outputs, detector recall, selected force-off application, status report requests, and alarm/event and detector log transfers.
- Can monitor up to 5760 intersections in 10 Zone Monitors, each Zone Monitor containing 24 zones with 24 intersections per zone.

Intersection Monitor II Features

- **POWER FAILURE** – INTERSECTION MONITOR II features an option for a priority 1 power fail event. This capability allows the unit to report a local power failure during the power outage. To use this feature, an SPS is required.
- **INTERSECTION FLASH** – Conflict (CMU), Voltage Monitor (CMU), police and local flash can be monitored and identified.
- **CYCLE FAILURE** – A "stuck" controller or controller that fails to cycle can be immediately identified and alarm generated.
- **CONTROLLER TIMING** – INTERSECTION MONITOR II provides monitoring for minimum and maximum green times and minimum clearance.
- **DETECTOR FAILURE** – 32 detectors
 - No activity
 - Max presence
 - Automatic or manual recall modes
 - Automatic force-off of phase with "failed" detector
 - Weekday and weekend time of day detector monitoring plans
- **STATUS ALARMS** – Minimum of seven user-defined status alarm inputs.
- **FLASHER FAILURE** – Cabinet flasher may be identified as failed.

Additional Features

- **AUTOMATIC DIAGNOSTIC REPORTS**
- **STATUS REPORTS**
- **DETECTOR RECALL** – Minimum, maximum, and fixed-time modes
- **DETECTOR LOGGING** – All logging features of Zone Monitor IV 15 minute detector volume counts
- **SPECIAL FUNCTION CONTROL** – Minimum of six undedicated outputs under direct operator control



3360 E. LA PALMA, P.O. BOX 6150, ANAHEIM, CALIFORNIA 92816-6150
TELEPHONE: (714) 630-3700 FAX: (714) 630-6349

ASC/2-2M ZONE MASTER

Description	Part Number
Telemetry module (FSK)	32825G1
Telemetry module (RS-232)	33525G1
Enclosure	32809G1
I/O interface module	32865G1
Power supply module	32815G1
Processor module*	32805G1
Display panel with keyboard	32834G1
Liquid crystal display module	32526P3X
Data module - not programmed	32845G1
Telemetry card rack	32824G1
Battery, 3V lithium	32897P1

KMCE-10,000 ZONE MASTER

Description	Part Number
Enclosure, expanded - consult factory	31910G1
Connector I/O panel - consult factory	31870G1
Keyboard display - consult factory	31840G1
I/O interface - consult factory	31805G1
Processor with Zone Master IV and standard configuration unless other specified	31730G6
Power supply - consult factory	31735G1
Telemetry module - consult factory	31845G2
Battery, 6V - consult factory	31395P1
Battery, 2V lithium - consult factory	31585P1
Telemetry card rack - consult factory	32824G1
Battery, 3V lithium - consult factory	32897P1

SYS-2

ASC/2-2M ZONE MASTER CONNECTING CABLES

Description	Part Number
Power cord (3-wire plug)	32864G1
Power cable	32864G2
I/O cable	32864G4
I/O plus one channel of telemetry	32864G10
FSK telemetry cable (2 channel)	32864G4
RS-232 telemetry cable	32864G7
Modem cable	32162P2

ADAPTER CABLES FOR ASC/2M IN CABINET WIRED FOR KMCE-10

Description	Part Number
Adapter, power cable	44938G1
Adapter, telemetry cable	44939G1

KMCE-10,000 CONNECTING CABLES

Description	Part Number
Power cable	31685G1
I/O No. 1 cable with special functions	31685G2
I/O No. 1 cable without special functions	31685G3
I/O No. 2 cable	31685G4
Recorder cable	31939G1
Modem cable (KMCE-10,000 to modem)	32162G1

MODEMS

Description	Part Number
2400 baud (Hayes)	32247P3
2400 baud (Hayes Optima)	32247P4

ZONE MONITOR IV SOFTWARE

Description	Part Number
Single user - 3.5", 720 Kbyte floppy disk	32677G2
Single user - 5.25", 1.2 Mbyte floppy disk	32677G3
Local area network - 3.5", 720 Mbyte diskette	32677G2xx
Local area network - 5.25", 1.2 Mbyte diskette	32677G3xx

xx = Number of work stations

Ordering example - 36277G402 LAN type Zone Monitor IV with 3.5", 1.44 Mbyte diskettes for 2 users.

INTERSECTION DATA MANAGER SOFTWARE

Description	Page Number
Intersection Data Manager software	32473G1

SYS-4

INTERSECTION MONITOR

Intersection Monitor II

Description	Part Number
Intersection Monitor II	32690G1
Intersection Monitor II w/standby power supply connector	32690G2
Interface panel, Intersection Monitor cabinet	32290G1
I/O #1 cable	32261G1
I/O #2 cable	32261G2
AC power cable from cabinet to Intersection Monitor	32261G3
Telephone cable	32164G1
Telemetry connecting cable to Intersection Monitor	31690G4
Standby power supply (SPS) (for 32690G2)	32695P1
SPS input cable - cabinet to SPS (for 32690G2)	32720G1
AC power cable from SPS to Intersection Monitor (for 32690G2)	55957P11
Battery pack 1 x 6 series (for 32690G2)	32696P1
Battery pack 2 x 3 series (for 32690G2)	32696P2
Battery cable - SPS to battery 6 feet (for 32690G2)	32697G3

Intersection Monitor I

Description	Part Number
Intersection Monitor I telephone interface module	32558P1

STAND-ALONE TELEMETRY

Description	Part Number
Stand-alone telemetry - consult factory	31905G2
Connecting cable power/I/O for stand-alone telemetry	32079G1
Telemetry cable	31690G10

SYS-6

FIBER-OPTIC INTERCONNECT

Description	Part Number
ASC/2 & ASC/2M telemetry module	33525G1
ASC/2M telemetry cable	32864G7
KMCE-10,000 telemetry module	32150G1
Interface panel - ASC/2 & KMCE-10,000 local and master	32680G2
KMCE-10,000 interface cable connects to J1 (master only in cabinet)	32689G1
KMCE-10,000 interface cable connects to M1 (master/local in cabinet)	32689G2
Modem with ST connector	32725P1
ASC-8000 telemetry module	32520G2
ASC/2 & ASC-8000 interface cable	31690G10
Interface panel power supply - local controller	32471P1
DB-25 cube tap	32727P1

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VIDEO VEHICLE DETECTION SYSTEMS

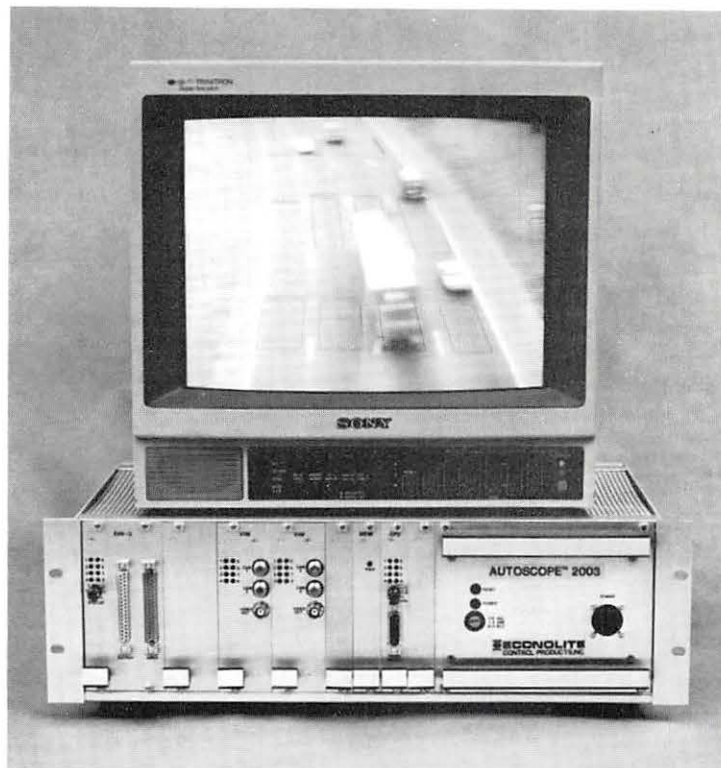
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AUTOSCOPE™-2003

Video Vehicle Detection System

Features

- Eliminates imbedded loops
- Shows detections in real time
- Rated for use in traffic cabinet
- Compatible with TS1/170/179 or TS2
- Choice of hardware for 32 or 64 detector outputs
- Choice of 2 or 4 video inputs
- Collects real-time traffic statistics
- For temporary as well as permanent installations
- Field-proven concept since 1989



AUTOSCOPE-2003 with RGB monitor.

Overview

AUTOSCOPE-2003 is a wide-area vehicle detection system which uses video imaging to replace inductive loops in multiple lanes and multiple directions of traffic. It accepts inputs from up to four video cameras overlooking the roadway and the detectors are drawn graphically on a video monitor using a mouse. Different types of detectors can be selected, and the detection zones may be placed anywhere and in any orientation within the combined field of view of the cameras. Special speed trap detectors can extract vehicle speed and vehicle classification as defined by length.

AUTOSCOPE-2003 is designed for outdoor installation in a traffic cabinet. It meets NEMA TS1/TS2 and 170/179 environmental requirements. It provides up

to 64 detector outputs, which can be connected directly to a controller. A system with four suitably located cameras can replace the inductive detection subsystem of even a large eight-phase intersection, from the loops to the loop amplifiers. AUTOSCOPE can also capture traffic data on a per-detection or per-time interval basis for later analysis.

AUTOSCOPE technology offers a long-term and cost-effective solution to the intersection detection, traffic management, surveillance and control concerns of today and tomorrow.

Field Proven

The patented technology used by AUTOSCOPE has been field tested since early 1989, and detection accuracy has been

documented to be equal to that of loops. Pattern recognition algorithms assure proper performance under challenging lighting, weather and traffic conditions, including dusk, nighttime, shadows, reflections, rain, snow and fog, as well as congested or stopped traffic.

The present model is the evolution of technology developed and tested by the University of Minnesota Center for Transportation Studies beginning in 1984. Model 2002, the predecessor product, has been commercially available since early 1991 as a tool for traffic research. Model 2003 is the result of a joint agreement between Econolite and Image Sensing Systems, Inc. of St. Paul, Minnesota for the development of an environmentally hardened version with detector-level outputs.

Benefits

Freedom from loops. Video detection avoids the maintenance expense associated with imbedded loops, which have been called the least reliable component of a traffic control system. Not only do the loops themselves fail, but the sawcuts required for their installation and frequent re-installation weaken the roadway and are a source of road erosion.

Visual feedback. Video detection shows the detection zones superimposed on images of traffic. The detection lines change brightness or color on a video monitor, thus providing visual verification of detector actuations.

Site flexibility. Video detection is feasible at sites where it would be very expensive or impractical to install inductive loops and their cable runs. Such sites include freeways, bridges, tunnels, and intersections involving a bridge, railroad tracks or light rail tracks.

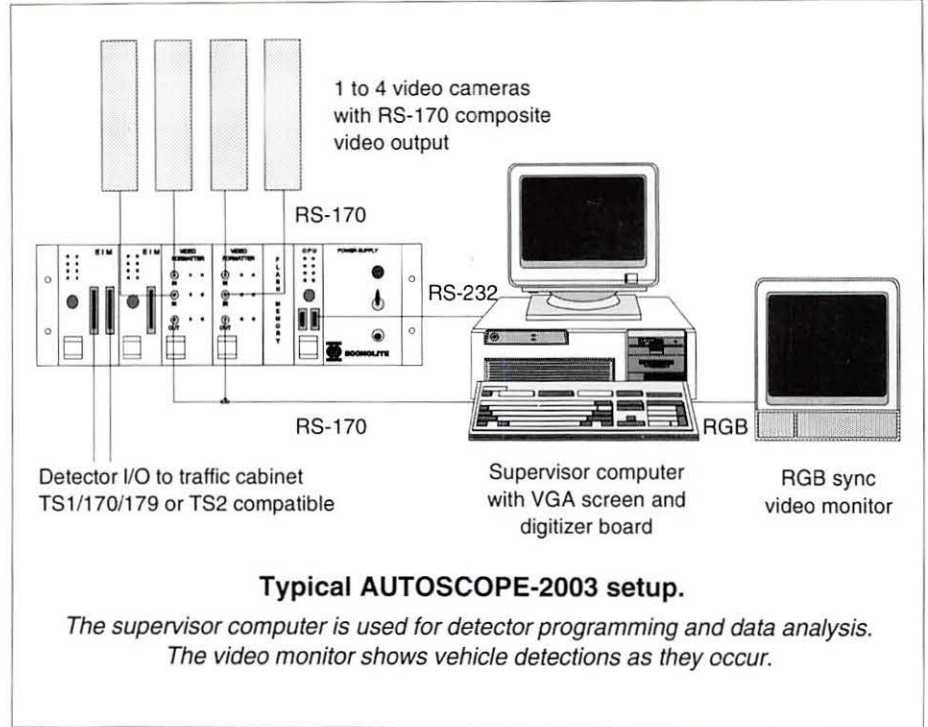
Powerful and economical. Video detection allows the implementation of advanced detection strategies which require different detector types and a large number of detection zones. Video is more economical than inductive loops when the number of detection zones is large, as required for IVHS. The typical installed cost of an inductive loop system for intersection control is \$1,000 per loop. This cost is several times higher in case of a freeway installation.

Easy to install. Video detection can be installed without disturbing the roadway or traffic flow. Once the basic hardware is on site, the detection zones can easily be redefined or repositioned on a video screen to adapt to changing traffic control or data collection requirements.

Designed for growth. The heart of AUTOSCOPE-2003 is a 486SX computer. Many of the unique vehicle detection and data capture capabilities are provided by software, which will continue to evolve to make the system even more versatile in the future.

Applications

Intersection Control. AUTOSCOPE-2003, in conjunction with up to four video cameras, can replace the loop detector subsystem for real-time intersection control. The number of detectors suggested in software will vary with the application.



For most standard applications, the system will support at least 48 detectors. Interface hardware is available for 32 or 64 detector channels and direct connection to a NEMA TS1, NEMA TS2, Type 170, Type 179 or SCATS controller. Detector types include stop line presence detectors, left turn pocket detectors, directional passage detectors and speed trap detectors.

Traffic Surveillance. AUTOSCOPE can augment existing video traffic surveillance systems by extracting quantitative data from the video signal. It can count vehicles in real time and compute the average of traffic parameters over user-defined time intervals (or time slices) as follows: volume per lane, flow rate, lane occupancy in percent, vehicle length classification, headway between vehicles (in seconds) and vehicle speed (in mph or kph).

Special Studies: Video detection is practical for temporary installations and special studies, such as traffic data collection by a planning department, a traffic consultant or a university. AUTOSCOPE can capture vast amounts of traffic data in its own non-volatile memory or on hard disk of the supervisor computer for later off-line graphing and analysis. The video sources may be live cameras or previously recorded video tapes. The recorded digital data is available in ASCII format.

System Hardware

Overview

The video detection system consists of from one to four synchronous television camera(s) or other video source(s), the AUTOSCOPE-2003 unit, a supervisor computer and an RGB video monitor. AUTOSCOPE may be mounted in a traffic cabinet or in a control room.

The supervisor computer and a video monitor may be temporarily connected to AUTOSCOPE via cable or modem to program a detector configuration or retrieve stored data. Once a detector configuration has been downloaded into AUTOSCOPE, the supervisor computer and video monitor may be disconnected. AUTOSCOPE will then operate independently, providing detector outputs and storing traffic data in its internal non-volatile memory. The same portable supervisor computer and video monitor may be used with multiple AUTOSCOPE units.

When the supervisor computer and video monitor(s) are connected, traffic data may be recorded directly on disk and be displayed on the computer screen in both numeric and graphic formats. Vehicle detections superimposed on the image of traffic may be observed on the video monitor(s).

AUTOSCOPE Hardware

Physically, AUTOSCOPE-2003 is an electronic unit measuring 19" W x 5.5" H x 10 1/4" D and suitable for either rack or shelf mounting. It has been designed for installation in a traffic cabinet and meets NEMA TS1 and TS2 environmental specifications, including the operating temperature from -35°C to +74°C. It is modular and is based on the Intel 486 SX microprocessor. Non-volatile memory, which is used for program and data storage, may be 2 MB or 4 MB. Please refer to the Ordering Guide for the list of available options.

Supervisor Computer System

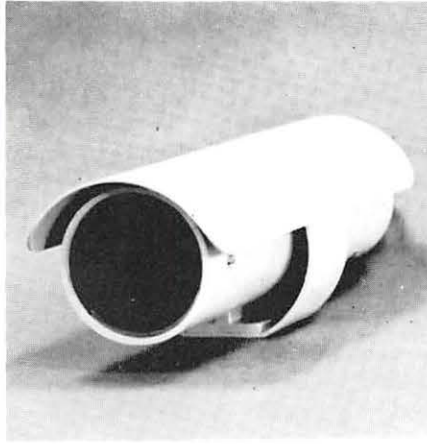
The minimum supervisor computer system, as needed for detector setup and viewing of vehicle detections, consists of a supervisor computer, an AUTOSCOPE Supervisor Digitizer Board and an RGB sync video monitor. Three types of computer may be used:

1. A laptop or portable computer that is carried to remote AUTOSCOPEs as needed for detector setup and retrieval of data.
2. An environmentally hardened computer that is installed in the traffic cabinet to store large amounts of traffic data.
3. A desktop computer located in a control room environment where video signals are processed.

The computer may be purchased from Econolite or a third party. Minimum computer specifications are the following:

- PC-compatible
- 386 processor
- MS-DOS 3.3 or MS-DOS 5.0
- Microsoft Windows 3.0 or 3.1
- One full-size expansion slot
- VGA monitor
- Mouse
- 4 MB of RAM
- 1.44 MB floppy disk drive
- 40 MB hard disk drive

An Autoscope Supervisor Digitizer Board furnished by Econolite occupies one full-size AT-compatible expansion slot. The signals from this board are used to drive an RGB sync monitor, which is used for detector programming and for viewing



Environmentally sealed video camera with sunshield.

vehicle detections. Monitors furnished by Econolite include Sony Model PVM-1341.

A 2400 or 9600 baud Hayes-compatible modem is optional to allow remote detector setup and retrieval of data stored in memory.

Camera System

From one to four medium-resolution monochrome or color video cameras may be used for real-time vehicle detection. Econolite recommends dedicated cameras for use with AUTOSCOPE, since camera location is critical for most applications and the pan/zoom/tilt settings need to remain fixed to retain detector configurations.

Minimum camera specifications include 383-line resolution, a 510 x 492 pixel CCD sensing element, automatic gain, automatic iris and absolute black reference. The limits of gain, iris and sensitivity are adjustable to prevent blooming during night-time hours. The camera furnished by Econolite is Burle Model TC 65EA. Suitable lenses have power zoom capability or a fixed focal length in the 8 to 48 mm range, as dictated by the specific mounting location.

The camera and lens assembly are housed in an environmental enclosure that is waterproof and dust-tight to NEMA-4 specifications to withstand high-pressure hose-down. A 15-watt heater is attached to the lens of the enclosure to avoid ice or condensation in cold weather. The enclosure furnished by Econolite is Burle Model TC 9393.

Hardware shipped by Econolite with each camera system includes galvanized steel junction boxes for pole mounting and a

video interface panel for use inside the traffic cabinet. In addition to terminal blocks, these items provide ground-fault interrupt circuits, lightning arresters and ground-fault isolation transformers.

Functional Capabilities

Detector Type and Placement

The detection zone may be placed anywhere and at any orientation within the combined field of view of the cameras. Preferred presence detector configurations are lines placed across or in-line with lanes of traffic. A single detector line can replace multiple conventional detector loops connected in series.

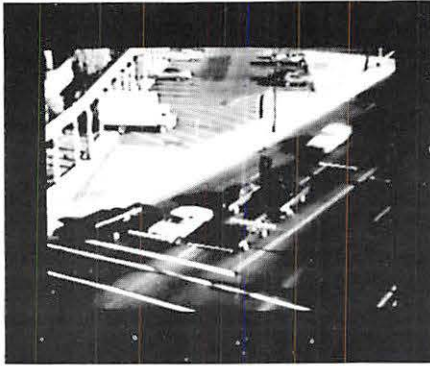
Different detector types are selectable via software. These include advance detectors, stop-line detectors, left-turn presence detectors, directional passage detectors and speed trap detectors. The latter report vehicle speed and classification based upon one of three user-defined length categories.

Detector Programming

Placement of the detection zones uses the supervisor computer operating in the Windows 3.0 or 3.1 graphics environment and the RGB video monitor. A mouse is used to draw new detection zones and to edit previously defined zones. Once a new detector configuration has been created, the supervisor computer system can display the detectors both on its own VGA screen and on the RGB monitor together with traffic. When a vehicle is under a detection zone, the detection zone changes in color or intensity, thereby providing visual verification of detection.

New detector configurations can be saved to disk, and previously saved detector configurations can be retrieved from disk for downloading into AUTOSCOPE. This feature allows the same AUTOSCOPE to be used with multiple cameras, each with its own detector configuration.

The preferred camera position is a minimum height of 35 feet above or immediately adjacent to the roadway. Reliable vehicle presence detection is possible over a range of several hundred feet. Accurate vehicle counting, speed measurement and length classification require a steep viewing angle so as to minimize the possibility of occlusion, where one vehicle covers another.



Typical live camera view plus detection lines used for intersection control

Local Data Storage

When the supervisor computer is off-line, AUTOSCOPE collects traffic data in its own non-volatile memory, which may be specified as 2 MB or 4 MB. This data may be retrieved at any time via a modem and dial-up telephone lines, via a private cable or fiberoptic network, or via direct cable connection to another computer. If the data is not retrieved, the oldest data is automatically overwritten by new data. AUTOSCOPE can count vehicles in real time and compute the average of traffic parameters over user-defined time intervals (or time slices) as follows:

- ☐ **Volume:** number of vehicles detected during the time interval.
- ☐ **Occupancy:** lane occupancy in percent.
- ☐ **Vehicle classification:** number of automobiles, single unit trucks or tractor trailers, as defined by length.
- ☐ **Flow rate:** vehicles per hour per lane.
- ☐ **Headway:** average time interval between vehicles.
- ☐ **Speed:** average vehicle speed in mph or kph.

The duration of the time intervals is user-selectable as 1, 5, 10, 15, 30 or 60 minutes. The base memory of 2 MB allows the accumulation of 15-minute time-interval traffic data for 48 detection zones data for a minimum of seven days.

Operation, Supervisor On-Line

When the supervisor computer is on-line, vehicle detections can be viewed in real-time as they occur on an RGB video monitor. It is also possible to display the

captured traffic data on the VGA screen of the supervisor computer in both numeric and graphic formats. The data to be displayed can be selected by pull-down menus and is shown in the form of windows in the Windows graphics operating environment.

When the supervisor computer is on-line, it is also possible to automatically save time-interval traffic data on hard disk as the time intervals are completed and to save all time data for individual vehicle detections. The data captured on disk is readily accessible in ASCII format for graphing or further analysis. One of the benefits of AUTOSCOPE is that it automatically provides the data needed for professional tables and graphs.

Site Survey, Installation and Training

A pre-deployment site survey by an Econolite representative is a prerequisite for any AUTOSCOPE field installation. This survey will determine the required camera locations, the choice of lenses, and any special hardware that may be needed.

Field installation is normally done by a contractor hired by the user agency. A qualified Econolite representative will supervise the field installation for a minimum of one day, load the AUTOSCOPE software, and verify proper operation. Two days of training will be provided to personnel of the user agency on the operation, setup and maintenance of the AUTOSCOPE system.

Post-Sale Support

AUTOSCOPE hardware and software are warranted by Econolite for one year. During the warranty period, technical support by telephone will be provided 24 hours per day by qualified personnel within a turn-around time of one (1) hour. Qualified personnel will be on site within forty-eight (48) hours if required.

Econolite is committed to a program of continuing development and support for AUTOSCOPE, including hardware and software. Software updates will be provided free of charge during the warranty period, then under a separate continuing support agreement.

Ordering Guide

Make a maximum of one entry per position and separate by hyphens.

Example: 2003-1-C1-M2-V2-E5

Position 1: Base model number

2003 = AUTOSCOPE-2003

Position 2: Power supply

1 = 120 VAC, 60 Hz

2 = 240 VAC, 50 Hz

Position 3: Processor

C1 = 486 SX with 2 MB of RAM

Position 4: Non-volatile memory

M2 = 2 MB

M4 = 4 MB

Position 5: Video channels

V1 = 2 RS-170 (NTSC) inputs,
1 switchable output

V2 = 4 RS-170 (NTSC) inputs,
2 switchable outputs

Position 6: Interface to controller

(the software will support at least 48 detectors in most applications)

E1 = 32 detector outputs,
compatible with NEMA TS2
Type 1 (one RS-485 line).

E2 = 32 detector outputs, compatible
with NEMA TS1.

E3 = 32 detector outputs plus 32
inputs (to sense intersection
phase), compatible with
NEMA TS1.

E4 = 64 detector outputs, compatible
with NEMA TS2 Type 1 (two
RS-485 lines).

E5 = 64 detector outputs, compatible
with NEMA TS1.

E6 = 64 detector outputs plus 32
inputs (to sense intersection
phase), compatible with NEMA
TS1.

Items to be ordered separately:

- Supervisor computer
- RGB sync video monitor
- One to four video cameras
with environmental enclosures
- Cabling and field installation

AUTOSCOPE™-2003LE "Loop Emulator"

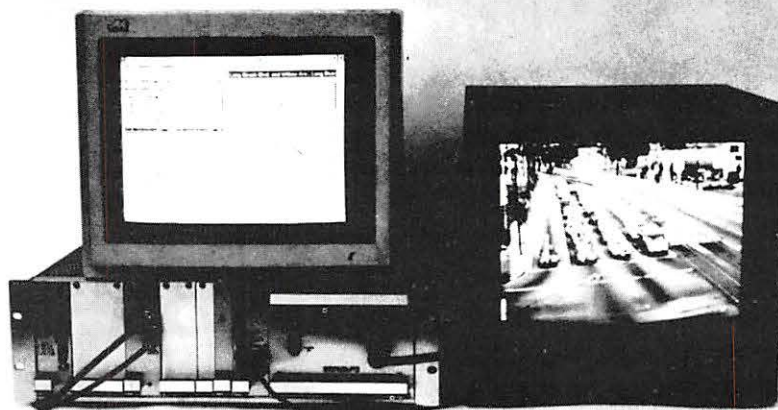
Video Vehicle Detection System

Features

- **Cost effective replacement for loops**
- **Shows detections in real time**
- **Image processor rated for use in traffic cabinet**
- **32 detector outputs compatible with TS1/TS2/170/179 controllers**
- **Accepts four video inputs from color or monochrome cameras**
- **For temporary as well as permanent installations**
- **Field-proven technology since 1989**

Overview

AUTOSCOPE-2003LE is a wide-area vehicle detection system which uses video imaging to cost-effectively replace the inductive loops used in standard intersections. It accepts inputs from up to four video cameras overlooking the roadway to handle all directions and traffic lanes. The detectors are drawn graphically on a video monitor using a mouse. Different types of detectors can be selected, and the detection zones may be placed anywhere and in



AUTOSCOPE 2003LE with RGB monitor and supervisor computer display

any orientation within the combined field of view of the cameras.

The AUTOSCOPE-2003LE image processor is designed for outdoor installation in a traffic cabinet. It meets NEMA TS1/TS2 and 170/179 environmental requirements. It provides 32 detector outputs, which can be connected directly to a controller. A system with four suitably located cameras can replace the inductive detection subsystem of even a large eight-phase intersection, from the loops to the loop amplifiers.

AUTOSCOPE-2003LE offers a cost-effective solution to the intersection detection concerns associated with loop failures and the weakening of the roadway caused by the cutting, sawing and imbedding of wires.

Field Proven

The patented technology used by AUTOSCOPE has been field tested since early 1989. Detection accuracy has been documented to be equal to that of loops. Pattern recognition algorithms assure proper performance under challenging lighting,

weather and traffic conditions, including dusk, night time, shadows, reflections, rain, snow, fog, as well as congested or stopped traffic.

AUTOSCOPE-2003LE represents the evolution of technology developed and tested by the University of Minnesota beginning in 1984. The AUTOSCOPE family of video vehicle detection systems is the result of a joint development agreement between Econolite and Image Sensing Systems, Inc. of St. Paul, Minnesota.

Benefits

- **Freedom from loops.** Video detection avoids the maintenance expense associated with imbedded loops, which have been called the least reliable component of a traffic control system. Not only do the loops themselves fail, but the sawcuts required for their installation and frequent re-installation weaken the roadway and are a source of road erosion.
- **Visual feedback.** Video detection shows the detection zones superim-

posed on real-time images of traffic. The detection zones change color or intensity on a video monitor, thus providing visual verification of detector actuation.

- **Site flexibility.** Video detection is feasible at sites where it would be very expensive or impractical to install inductive loops and their cable runs. Such sites include freeways, bridges, tunnels, and intersections involving a bridge, railroad tracks or light rail tracks.
- **Easy to install.** Video detection can be installed without disturbing the roadway or traffic flow. Once the basic hardware is on site, the detection zones can easily be redefined or repositioned on a video screen to adapt to changing traffic control requirements.
- **Economical and powerful.** The AUTOSCOPE-2003LE provides a cost effective alternative to inductive loops, especially when the number of detection zones is large. Video detection also allows implementation of advanced detection strategies which require multiple detector types and a large number of detection zones.

Applications

Intersection control. AUTOSCOPE-2003LE, in conjunction with up to four video cameras, can replace the loop detector subsystem for real-time intersection detection and control. The system provides for a maximum of 32 presence or count detection zones.

Interface hardware permits direct connection to a NEMA TS1, NEMA TS2, Type 170 or Type 179 controllers. Detector types provide presence, count, and directional detection.

Traffic surveillance. AUTOSCOPE-2003LE can augment existing video traf-

fic surveillance systems by providing visual verification that vehicles are being detected in real time, as evidenced by flashing detection zones on a video monitor.

System Hardware

Overview

The video detection system consists of from one to four synchronous compact television cameras or other video sources, the AUTOSCOPE-2003LE unit, a supervisor computer with an integrated digitizer board and color VGA video monitor.

The supervisor computer may be temporarily connected to the AUTOSCOPE-2003LE via cable or modem to program a detector configuration. Once a detector configuration has been downloaded into AUTOSCOPE-2003LE, the supervisor computer may be disconnected. AUTOSCOPE-2003LE will then operate independently, providing detector outputs to a traffic controller. A single supervisor computer and video monitor may be used with multiple AUTOSCOPE-2003LE control units.

With a supervisor computer and video monitor connected to the AUTOSCOPE-2003LE, vehicle detections may be superimposed on a live video roadway image.

Cost Effectiveness

AUTOSCOPE-2003LE is the cost-effective solution for complete intersection detection. At a price tag less than that of the full-featured model 2003, the AUTOSCOPE-2003LE "Loop Emulator" performs the standard detection functions of inductive loop detectors, but eliminates the need to stop traffic for loop installation and maintenance, eliminates sawing into the roadway, and reduces the failures normally associated with conventional inductive loops.

Nationwide, research has shown that installed inductive loops cost in excess of

\$1,000 per channel of detection. Since AUTOSCOPE-2003LE eliminates the need for the traditional loop detector and reduces maintenance costs associated with wire loops at \$1,000 per loop every five years, AUTOSCOPE technology leads the way in cost-effective detection.

One major AUTOSCOPE user has stated that this system will save his agency more than \$100,000 annually due to the frequent failure of inductive loops experienced in the past.

AUTOSCOPE-2003LE is designed for all intersection and freeway detection applications where the collection of traffic data is not required, and accurate vehicle detection is necessary. Should data collection be something you desire, please ask your Econolite Representative for information on the full-featured AUTOSCOPE-2003 and family of related systems.

Ordering Guide

Make a maximum of one entry per position and separate by hyphens.

Example: 2003LE-X

Includes: 486SX CPU with 2 MB of RAM, 2MB non-volatile memory, four RS-170 (NTSC) video inputs with two switchable outputs and 120 VAC 60 Hz power supply.

X indicates interface to controller:

E1 = 32 detector outputs compatible with NEMA TS2 Type 1 controllers.

E2 = 32 detector outputs, compatible with NEMA TS1/TS2 and Type 170/179 controllers.

Items to be ordered separately:

- Supervisor computer
- RGB sync video monitor (if required)
- One to four video cameras with environmental enclosures
- Cabling and field installation

AUTOSCOPE™

Model Number	Description	Part Number
2003	AUTOSCOPE-2003	---
2003LE	AUTOSCOPE-2003LE	---
AS-CAM	Camera package (includes assembled and aligned camera, enclosure sunshield, fixed focal length lens, mounting bracket, junction box, coax and power cables between camera and junction box)	---
AS-CIP-X	Camera interface panel (includes lightning arrestor, ground isolation transformer (if required) and terminal blocks)	44975GX
AS-SDS	Supervisor digitizer and software (includes supervisor digitizer, supervisor software, 25 feet null modem cable, (2) 25 feet coaxial cable (BNC-RCA male))	44977G1
AS-CBL	Cables and hardware (includes AUTOSCOPE power cable, EIM wiring harnesses, coaxial cable (between camera interface panel and AUTOSCOPE))	---
AS-TRN	Training (includes two days of training covering complete system orientation and operation)	---
AS-SC386	AUTOSCOPE 386 portable supervisor computer	---
AS-SC486	AUTOSCOPE 486 portable supervisor computer	---
AS-RGB	RGB sync video monitor	---
AS-COAX	RG59U standard coaxial cable	---
AS-COAXHM	Coaxial cable-high mast lighting	---

X = Camera circuit on panel (1 through 4)

AUTOSCOPE™ REPLACEMENT PARTS

Description	Part Number
AUTOSCOPE power supply module (115 VAC)	33440G1
AUTOSCOPE CPU module	33410G1
AUTOSCOPE memory module (2 MB)	33420G1
AUTOSCOPE video interface module (RS 170/NTSC)	33415G1
AUTOSCOPE external interface module #1	33483G1
AUTOSCOPE external interface module #2	33483G2
AUTOSCOPE external interface module #3	33483G3
AUTOSCOPE enclosure	33405G1

AUTOSCOPE™ CABLES

Description	Part Number
Power supply	33457G1
Power supply w/plug	33457G6
EIM SDLC cable	---
EIM parallel input cable	33457G3
EIM parallel output cable	33457G2
20' coax - J-box to camera	44965G2
20' power - J-box to camera	44966G2
25' coax - VIM to digitizer	33493G25
25' null modem	33492G25
RGB sync cable	44978P1
8' coax - CIP to VIM	33943G8

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EMTRAC™ Spread Spectrum Radio Preemption System

Features

- Provides right of way for emergency vehicles
- Clears congestion
- Reduces accidents
- Speeds response time
- Saves lives
- Logs preemption data
- Compatible with NEMA and 170 controllers
- Range programmable from 100' to over 2400'
- Does not need FCC radio site license
- Not limited to line of sight
- Easy installation
- Five-year warranty

Description

System overview

EMTRAC™ is a preemption system which uses digitally-coded spread-spectrum radio to command a green signal for vehicles through signalized intersections. It is ideal for emergency vehicles, where it speeds response time, reduces traffic accidents, and saves lives. It can also be



used to improve the productivity of buses, snow plows and other service vehicles by minimizing the time waiting at red signals. Up to three levels of priority can be assigned for preemption purposes.

The use of radio provides a preemption range in excess of 2,400 feet and avoids the line-of-sight limitations, cleaning and relamping associated with optical systems. State-of-the-art spread-spectrum radio avoids the need to apply for an FCC site license, as required for conventional fixed-frequency radio. In spread-spectrum radio, a narrow-band signal is swept over a broad portion of the frequency spectrum, with digital synchronization between the transmitter and receiver modules (which are both transceivers).

Physically, the EMTRAC system consists of a transmitter with a directional antenna and an electronic auto-compass in each vehicle, and a receiver with an omnidirectional antenna at each intersection. The direction of preemption can be set automatically by the auto-compass, which senses the orientation of the vehicle. It can also be set manually from the transmitter and can be different from the direction of travel of the vehicle. This

feature allows congested traffic to be cleared in any direction.

The transmitter, receiver and auto-compass are microprocessor based. A laptop computer with menu screens is used to program all devices and retrieve logged data via an RS-232 interface.

Vehicle hardware

The transmitter is a compact unit that is normally bracket-mounted on the dashboard of the vehicle. Its front panel provides six membrane switches, each with an associated LED indicator lamp. A switch marked AUTO activates the auto-compass. Switches marked NORTH, EAST, SOUTH, WEST can override the auto-compass to manually set the direction of preemption. Two independent 12V lines are required to power the transmitter. Normally one of these lines is wired to a parking brake sensor or to a driver-side door sensor to automatically terminate preemption calls when the vehicle is parked.

The vehicle antenna is a directional two-element horizontal array, with gain in the direction of travel. It is housed in an aesthetically pleasing PVC enclosure.

Intersection hardware

Two receiver models are available. Both are designed for installation in a traffic cabinet and meet NEMA/170 environmental and electrical specifications. Model SS1600RS is shelf-mountable and for use with NEMA controllers with a built-in preemptor. Model SS1600RM is for installation in a NEMA or 170 detector rack, with power provided by the back panel.

Four preemption outputs are standard, each with two priority levels. Level 1 is normally assigned to high-priority emergency vehicles; level 2 is for low-priority buses. For diagnostic purposes, LED lamps on the front panel indicate the preempt direction and priority level.

The intersection antenna is omnidirectional and may be mounted on the pole closest to the traffic cabinet.

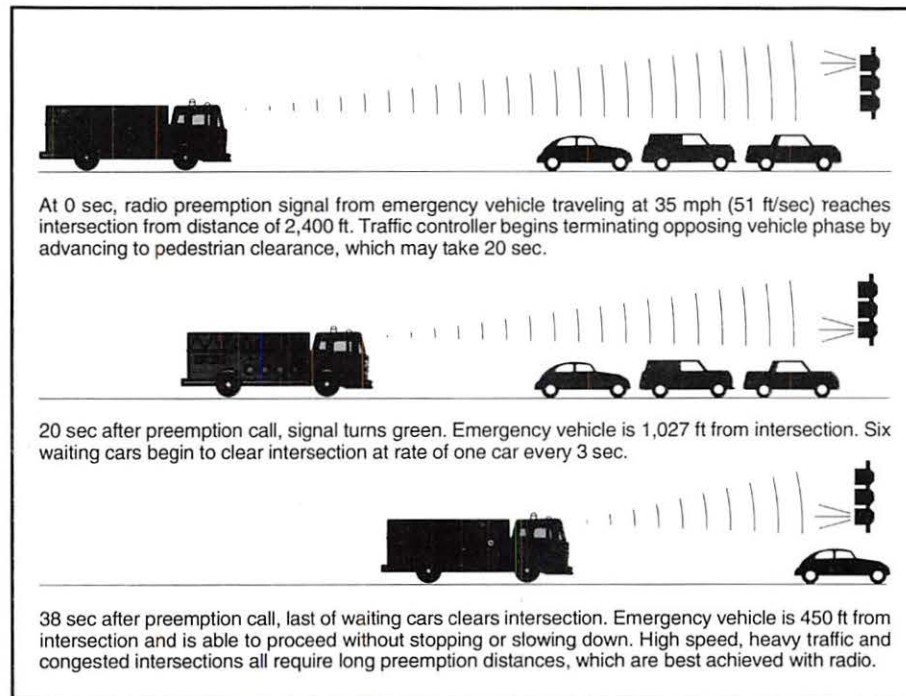
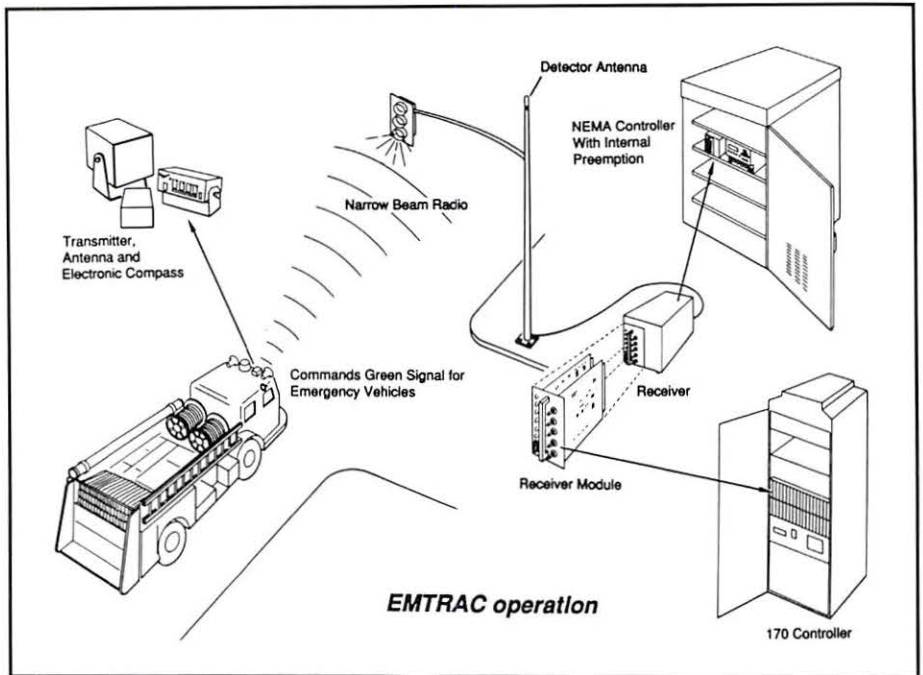
System software

A DOS-compatible, portable computer is used to set up the EMTRAC transmitter, receiver and auto-compass. The exact auto-compass split points to change from north to east, east to south, south to west, and west to north are programmable. Setup is easy and is 100% menu-driven. The computer can be also be used to re-

trieve time and date-stamped preemption logs.

Warranty & support

The transmitter, receiver and auto-compass are warranted or a full five (5) years. Following installation and initial setup by the user agency, Econolite or its contractor will verify system performance and make any final adjustments if required.



Ordering Guide

SS1600TK = Transmitter kit. Includes radio unit, 12V power cable, directional antenna and auto-compass.

SS1600RS = Shelf-mount receiver for NEMA controller. Includes cable assembly and omnidirectional antenna.

SS1600RM = Rack-mount receiver module for NEMA or 170 rack. Includes omnidirectional antenna.

CA1600K = Cable kit. Includes cables from laptop to transmitter or receiver, and from laptop to auto-compass.

SL1600 = Software license. One required per agency.

ET1600 = Suitcase tester. Plugs into transmitter, receiver and auto-compass to verify system operation.

Technical data

External dimensions, H x W x D:
 Transmitter..... 2.75" x 6.5" x 4.5"
 Auto-compass..... 2.25" x 3.75" x 4.75"
 Receiver..... 5.0" x 5.0" x 8.5"
 Radio type..... Spread spectrum
 Radio frequency..... 902 - 928 MHz
 Radio range..... 100 to 2400 ft
 Operating temperature..... -35 to +75°C
 Power to transmitter..... 12 VDC
 Power to receiver..... 120 VAC



ECONOLITE
CONTROL PRODUCTS, INC.

3360 E. La Palma, Anaheim, California 92806-2856
 P.O. Box 6150, Anaheim, California 92816-0150
 Telephone: (714) 630-3700 FAX: (714) 630-6349

SPREAD SPECTRUM EMTRAC**Vehicle Package**

Model Number	Description	Part Number
SS1600T	Vehicle transmitter	33304G2
AC1600	Auto-compass	33309G1
SS1600TA	Directional antenna	33369G1
CA1600T	12V power cable	33331G1
SS1600TK	Vehicle package (includes above 4 items)	33301G1

Intersection Package, Shelf-Mount

Model Number	Description	Part Number
SS1600R	Receiver unit, shelf-mount	33302G2
CA1600R	Cable assembly for shelf-mount receiver	33331G6
SS1600RA	Antenna kit, omnidirectional (includes antenna, pole plate, and two male BNC connectors; requires coax cable CX900)	33364G1
SS1600RS	Intersection package, shelf-mount (includes above 3 items)	33373G1

Intersection Package, Rack-Mount

Model Number	Description	Part Number
SS1600M	Receiver unit, rack-mount	33319G1
SS1600RA	Antenna kit, omnidirectional (includes antenna, pole plate and two male BNC connectors; requires coax cable CX900)	33364G1
SS1600RM	Intersection package, rack-mount (includes above 2 items)	33373G2

PMPT-2

SPREAD SPECTRUM EMTRAC

Accessories

Model Number	Description	Part Number
CX900	Coax cable, Teflon dielectric, rated 900 MHz (required for installation of receiver antenna - specify number of feet)	33379P1
SS1600SL	Software license (one license required per agency)	33353G1
CA1600K	Computer cable kit (one kit required per agency; includes cable from laptop computer to transmitter or receiver and cable from laptop computer to auto-compass)	33374G1
ET1600	Suitcase tester option (simultaneously plugs into transmitter, receiver and auto-compass to verify system operation)	33314G1

Replacement Parts

Description	Part Number
Receiver antenna, spread spectrum	33369P2
Pole plate for attachment of spread spectrum receiver antenna, provides 1-1/2" pipe thread for antenna and 1-1/4" downward hub	E2153P2
Plug for 1-1/2" downward hub of pole plate	33382P7
Data cable, laptop computer to transmitter or receiver	33338G1
Data cable, laptop computer to auto-compass	33342G1
BNC connector, 50 ohm, for CX900 coax cable; Amphenol P/N 31-320-RFX	33380P1
Crimp tool for BNC connector, Amphenol P/N CTL-1	33381P1

NARROW-BAND EMTRAC

Vehicle Package

Model Number	Description	Part Number
16-ET-AS	Vehicle package (includes transmitter unit, antenna, 12 V power cable, auto-compass, and cable from transmitter unit to auto-compass)	Use Model Number
160-M-4	Receiver, shelf-mount (for NEMA controllers with internal preemption capability; requires power harness 160-M-003, external antenna, and installation)	Use Model Number
160-M-003	Power harness for shelf-mount receiver	Use Model Number
170-M-4	Receiver, rack-mount (mounts directly in input file of Type 170 controllers and in NEMA detector racks; requires wire harness 170-M-003, external antenna and installation; Type 170 controllers require preemption software)	Use Model Number
170-M-003	Wire harness for rack-mount receiver	Use Model Number

Accessories

Model Number	Description	Part Number
MC-600	External antenna for receiver (required for all receivers; includes pole-mounting bracket, 50 ft of coax cable and two BNC connectors)	Use Model Number
CX900	Extra coax cable (teflon dielectric, rated 900 MHz - specify number of feet)	33379P1
SW-2600-00	Software license (one license required per agency)	Use Model Number
CA1600K	Computer cable kit (one kit required per agency; includes cable from laptop computer to transmitter or receiver and cable from laptop computer to auto-compass)	33374G1
ET1600	Suitcase tester option (simultaneously plugs into transmitter, receiver and auto-compass to verify system operation)	33314G1

PMPT-4

NARROW-BAND EMTRAC

Replacement Parts

Description	Part Number
Auto-compass	33309G1
Data cable, laptop computer to transmitter or receiver	33338G1
Data cable, laptop computer to auto-compass	33342G1
BNC connector, 50 ohm, for CX900 coax	33380P1

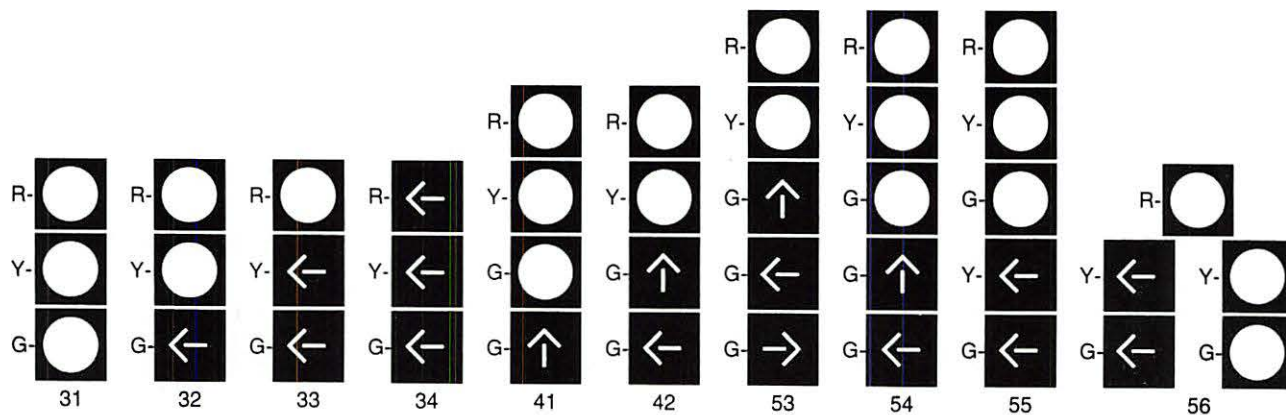
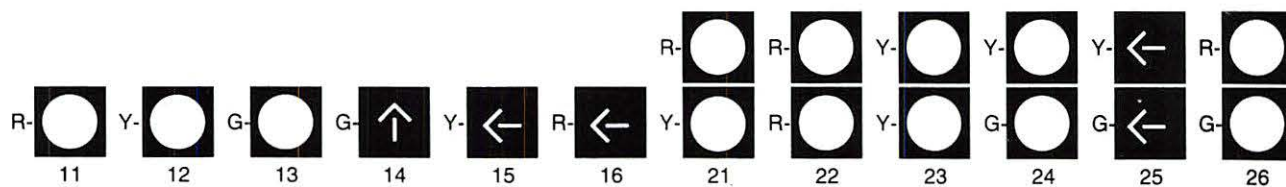
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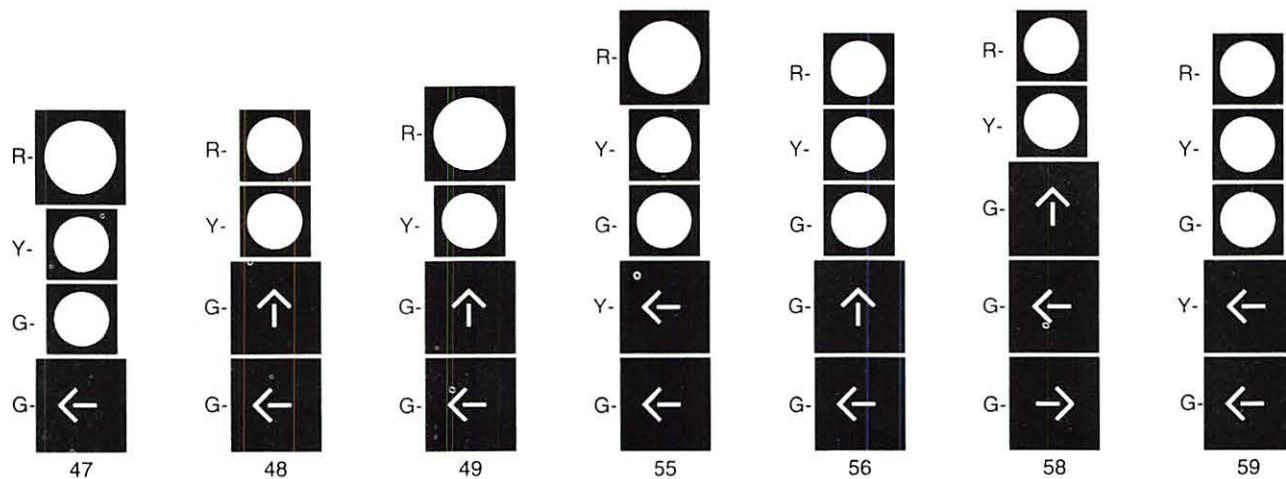
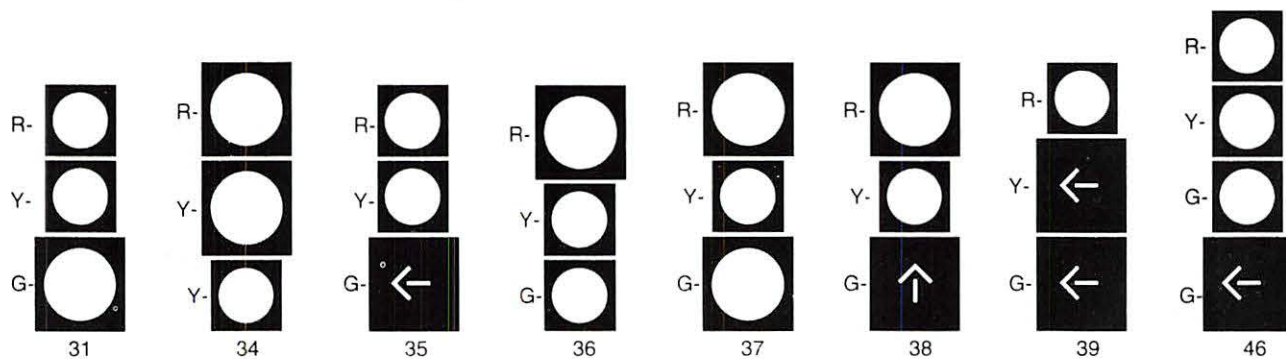
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FACE ARRANGEMENTS 8" & 12" VEHICLE SIGNALS



COMBINATION VEHICLE SIGNALS

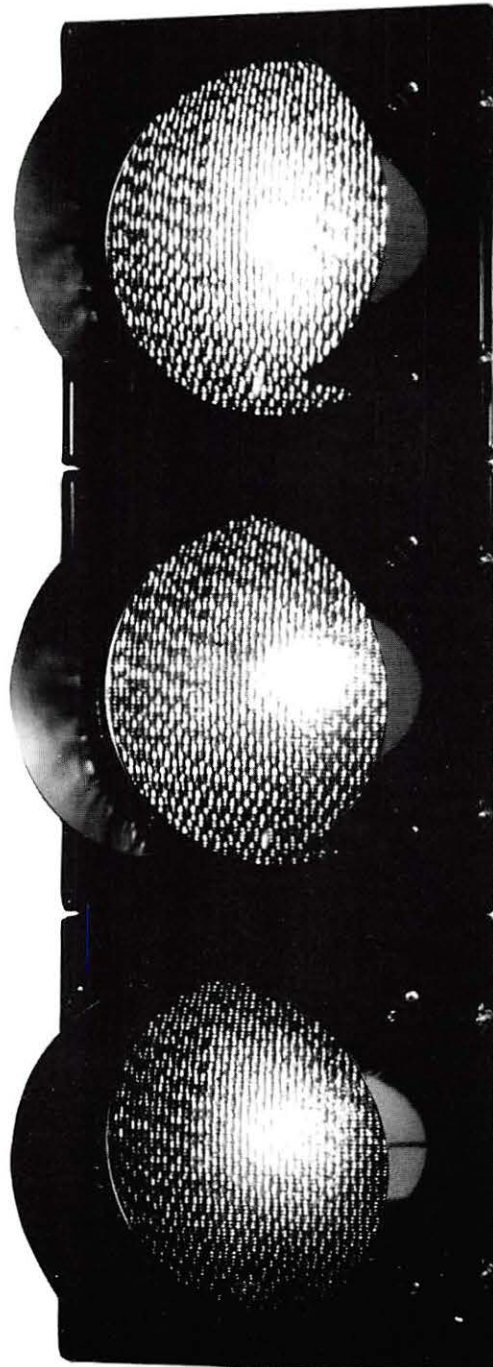


R = Red Y = Yellow G = Green

8-Inch Incandescent Aluminum Signal

Features

- Tested to over 80 mph wind loading on single point attachment
- Aesthetically designed - No protruding hinges or latches
- Stainless steel hardware
- Doors equipped with two latches
- Reversible door - left side standard; right side optional
- "Fast-on" tab terminal block
- Terminal block identifiers cast into housing
- Provisions for two, five-position terminal blocks in each housing
- EPDM or optional red silicone lens gasketing



Design and Construction Features

Durable Housing

Housing and door assembly die-castings were designed with the aid of a computer to deliver maximum strength with minimum weight for unmatched tolerance to wind loading and resistance to knock-down damage. Corrosion resistant aluminum alloy castings and stainless steel hardware make the unit virtually immune to weathering.

Corrosion Resistant Finishes

A 90,000 V negative charge is applied to the paint to insure proper application to the aluminum components. The paint is then baked on and cured in Econolite's modern finishing department.

Positive Sealing

Door gasket seals out dirt and moisture. Precision molded lens gasket provides a second barrier to outside contamination. Lens gasket's slotted design simplifies lens replacement and orientation in the field.

Efficient Lenses

Multi-prism wide angle glass or optional polycarbonate lenses provide a bright indication with optimum light distribution that meets or exceeds ITE requirements. Also available are special lenses including arrows.

Shurlock Boss

Radial angular grooves cast into the top and bottom of the signal head housing along with Econolite Shurlock fittings permit alignment adjustments in 5 degree increments and hold the head firmly in place.

Prefocused Reflector and Lamp Mount

Unitized specular alzak aluminum reflector and phenolic lamp receptacle are "prefocused" for optimum optical performance. Lamp receptacle rotates for proper filament orientation. A bail holds the lamp firmly in place. Two stainless steel hinge pins allow the reflector to be swung open for easy maintenance, and compression spring permits fast removal without any tools.

Modular Design

Two attaching washers and three bolts make it easy to add sections. They also permit any section to be rotated independently about the vertical axis and hold each section securely in place to prevent misalignment.

Terminal Block

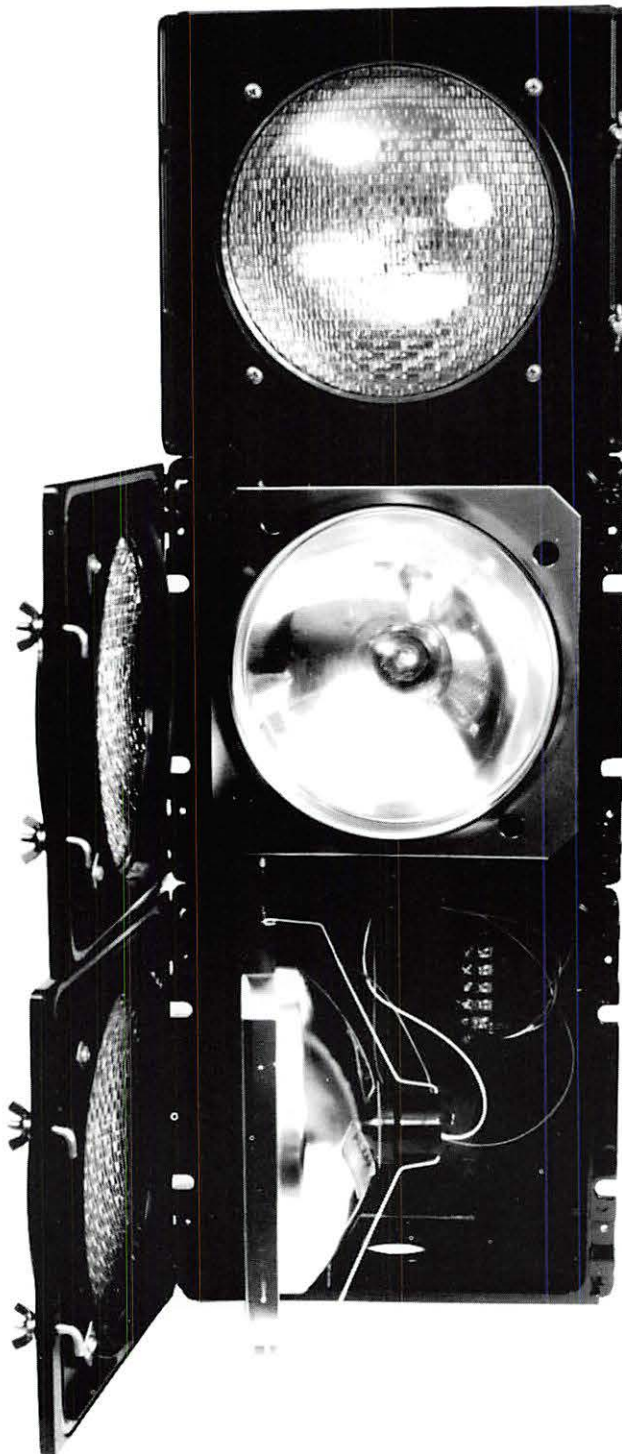
One five-position terminal block with "fast-on" tabs on one side and screw clamps on the other side is provided. Mounting points for a second block are also present. Raised letters cast into the housing identify each position on the terminal block.

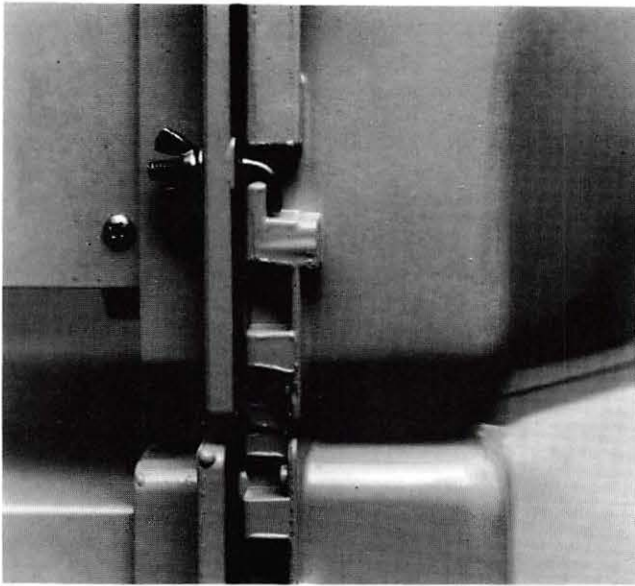
Reversible Door Mounting

Door may be mounted on either side, permitting easy access to closely mounted signals. This makes it ideal for cluster mounted signals. Two integrally cast hinge lugs and latch screw slots are located on each side of the housing. Through a symmetrical concept each housing is capable of providing either right- or left-hand door opening. Left hinge is standard; right hinge is optional and must be specified.

Versatility

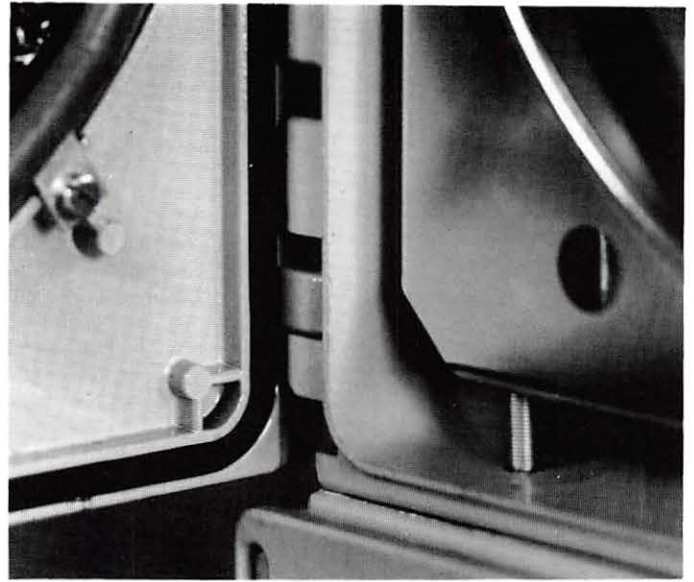
The 8-inch section may be used vertically or horizontally as a single section beacon or in combination with 12-inch sections and even with most other manufacturers' signals. Flat back housing often simplifies mounting for special applications. A complete line of visors, louvers and backplates is available.





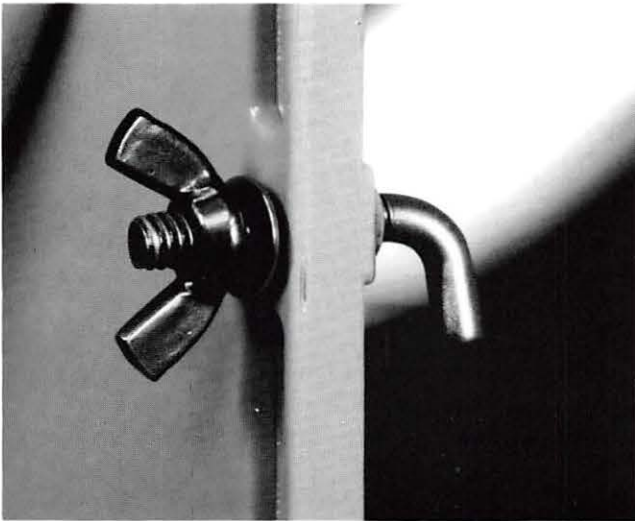
Housing

Computer assisted design of the signal head door and housing assures maximum strength with minimum weight for all stress points within the door-housing assembly. Housing ends, Shurlock bosses, hinge points and fastener seat areas are all optimally designed to make the assembly one of the strongest signal head housings ever constructed.



Gusseted Gasket Channels

Positively captured gasket channel adds strength to the door in addition to providing correct alignment of gasket when closing the door to achieve higher integrity in weatherproofing.



Wing Nut Fasteners

Stainless steel "L" shaped wing nut fasteners were selected after testing numerous fastening methodologies. This specially engineered fastener permits opening of the door assembly, even if heavily coated with ice and snow. Fastener "breaks free" quickly from the housing with minimum effort and use of only one hand. The twin "L" fasteners also assure uniform pulldown of the door, gasket, and housing for positive seal.



Engineered Lamp Pre-Focus

Socket base to lamp filament distance has been carefully considered and engineered for the majority of traffic signal lamp bulb manufacturers. This assures maximum light output for any given lamp wattage.

Specifications

8-Inch Aluminum Signal Head

General

Each traffic signal head shall consist of a number of completely identical signal sections rigidly fastened together to present a continuous, pleasing appearance. Each section shall have a separate and complete housing. The traffic signal shall meet or exceed the Equipment Standard of the Institute of Transportation Engineers' (ITE) latest revision.

Housing

The housing of each section shall be a one-piece corrosion resistant aluminum alloy die-casting. Two integrally cast hinge lugs and two integrally cast latch screw slots shall be on each side of the housing. Through a symmetrical concept each housing shall be capable of providing either right- or left-hand door opening. Left hinged is standard; right hinged is special and must be specified. The top and bottom of the housing shall have an opening to accommodate standard 1-1/2 inch pipe brackets. Each signal section shall be rigidly attached, one above the other, by means of corrosion resistant bolts and attaching washers in such a manner that any section may be rotated about a vertical axis and oriented with respect to an adjacent section.

The top and bottom opening of the signal housing shall have a Shurlock boss integrally cast into the housing. The radial angular grooves of the Shurlock boss, when used with Shurlock fittings, shall provide positive 5-degree increment positioning of the entire signal head to eliminate rotation or misalignment of the signal. Each housing shall have cast bosses for two five-position terminal blocks. Each position shall be identified with both number and function cast on housing. The back of each housing shall have the manufacturer's name clearly displayed. Each housing shall have provisions for easily adding a back plate. Hinge pins, door latching hardware, visor backplate, and lens clip screws shall be high quality stainless steel.

Housing Door

The housing door of each section shall be a one-piece, corrosion resistant, aluminum alloy die casting. Two hinge lugs shall be cast on one side of the door, and two latch points shall be cast on the other side. The door shall be attached to the housing by means of two hinge

pins. The door shall be easily removable without the use of tools. Two latch screws and wing nuts on one side of the door shall provide for opening and closing the signal door without the use of any special tools. A gasket groove on the inside of the door shall accommodate a weatherproof and mildewproof resilient gasket which, when the door is closed, shall seal against a raised bead on the housing, making a positive seal. The outer face of the door shall have four holes equally spaced about the circumference of the lens opening, with four screws to accommodate the signal head visors. The door shall have at least two index points to enable easy positive orientation of the lens. The door and visor shall overlap 1/2 inch to prevent light escaping between visor and door (visor collar).

Optical System

Lens. The prisms traffic signal lens shall be standard red, yellow, or green and shall conform to the latest revision of the ITE standard specifications. The lens shall fit into a specially designed, slotted, extruded, and bonded full-circle EPDM lens gasket designed to fit the housing door in such a manner so as to exclude moisture, dust, and road film. The lens and gasket shall be secured to the door with four aluminum lens clips and stainless steel screws. The lenses shall be polycarbonate or glass, as specified.

Reflector. The reflector assembly shall be a unitized hydroformed alzak aluminum reflector. The assembly shall be pivoted in the signal housing on two stainless steel pins in such a manner that it can be easily swung open for servicing the unit. The entire assembly is easily removed for maintenance or service without the use of any tools.

Lamp Receptacle. The prefocused, molded phenolic lamp receptacle is equipped with a lamp grip to prevent the lamp working loose due to vibration. The receptacle may be rotated to allow proper orientation of lamp filament.

Bail. The bail shall be a zinc-plated piano wire assembly that secures and orients the socket to the reflector.

Wiring

Each receptacle shall be provided with two leads with "fast-on" type terminals. Wires shall be color coded per customer specifications.

Lamp receptacle conductors shall be No. 18 AWG, or larger, 600-volt appliance wiring material, which conform to Military Specification: MIL-W-16878 D, Type B, with a vinyl nylon jacket rated 115 degrees Centigrade.

Terminal Block

Each complete signal face shall be provided with a terminal block. The terminal block shall be placed in the bottom section unless otherwise specified. The terminal block for a standard three-section head shall be a five-position, ten-terminal, barrier-type strip. To one side of each "fast-on" terminal strip shall be attached the AC common, red, yellow, and green signal section leads, leaving the opposite screw-clamp terminal for field wires.

Visors

Visors shall be tunnel, full-circle or cap, and a minimum of 7 inches long. Visors shall be formed of corrosion-resistant aluminum alloy sheet. They shall have twist-on attaching tabs to facilitate installation.

Painting

All interior and exterior parts of the housing, door, backplate, and visor shall be pretreated for painting in the following stages: degrease, hot rinse, etch with an iron phosphate solution, hot rinse, chemical seal, and dry for at least 10 minutes at 300 degrees Fahrenheit. The parts shall then be painted with a single coat of environmentally safe, ultraviolet resistant, polyester powder coating, which shall be applied electrostatically at 90 kV and baked for 20 minutes at 375 degrees Fahrenheit per ASTM D-3359, ASTM D-3363 and ASTM D-522. The signal head color shall be specified by the customer, except the inside of the visor and the front side of the backplate shall be painted dull black. Stainless steel latching devices shall not be painted.

Standard colors are:

Dark olive green - shall match Federal Standard 595a-144056

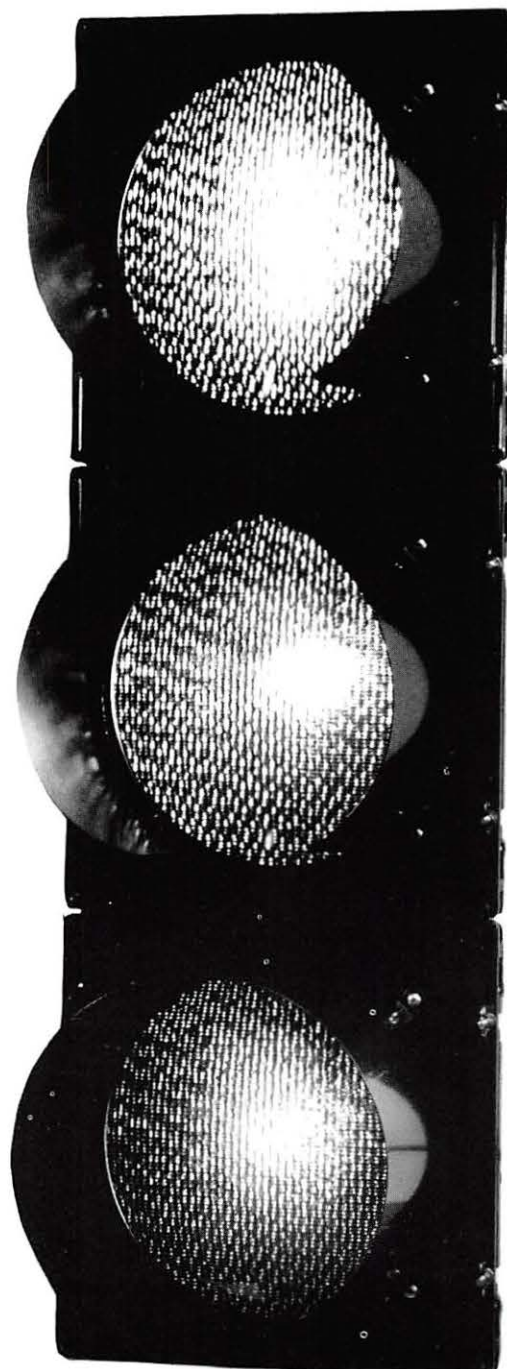
Yellow - shall match Federal Standard 595a-13538

Dull Black - shall match Federal Standard 595a-37038

12-Inch Incandescent Aluminum Signal

Features

- Tested to over 80 mph wind loading on single point attachment
- Straight sides — No protruding hinges or latches
- Stainless steel hardware
- Doors equipped with two latches
- Reversible door — left side standard; right side optional
- "Fast-on" tab terminal block
- Terminal block identifiers cast into housing
- Provisions for two, five-position terminal blocks in each housing
- EPDM or optional red silicone lens gasketing



Durable Housing

Housing and door assembly die-castings were designed with the aid of a computer to deliver maximum strength with minimum weight for unmatched tolerance to wind loading and resistance to knock-down damage. Corrosion resistant aluminum alloy castings and stainless steel hardware make the unit virtually immune to weathering.

Corrosion Resistant Finishes

A 90,000 V negative charge is applied to the primer and paint to insure proper application to the aluminum components. The paint is then baked on and cured in Econolite's modern finishing department.

Positive Sealing

Door gasket seals out dirt and moisture. Precision molded lens gasket provides a second barrier to outside contamination. Lens gasket's slotted design simplifies lens replacement and orientation in the field.

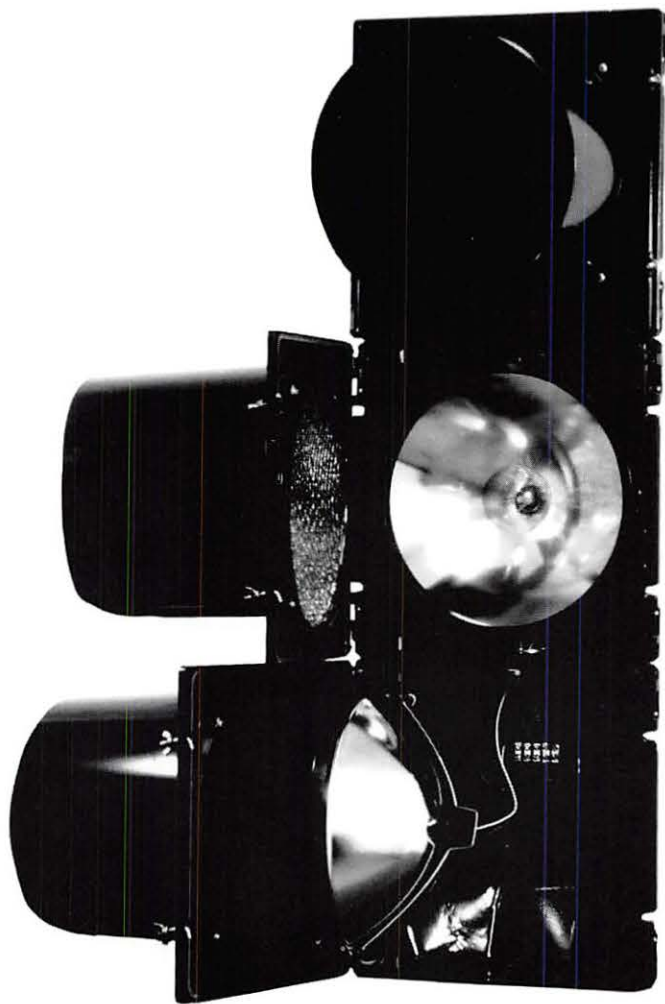
Efficient Lenses

Multi-prism wide angle glass or optional polycarbonate lenses provide a bright indication with optimum light distribution that meets or exceeds ITE requirements. Also available are special lenses including arrows.

Shurlock Boss

Radial angular grooves cast into the top and bottom of the signal head housing along with Econolite Shurlock fittings permit alignment adjustments in 5 degree increments and hold the head firmly in place.

(Ring/Spun Reflector)



Prefocused Reflector and Lamp Mount

The reflector consists of a glass-filled polycarbonate reflector ring, spun alzak aluminum reflector and phenolic lamp receptacle and is "prefocused" for optimum optical performance. The assembly is pivoted in the signal housing on two stainless steel pins in such a manner that it can be easily swung open for servicing the unit. The entire assembly is easily removed for maintenance or service without the use of any tools.

Modular Design

Two attaching washers and three bolts make it easy to add sections. They also permit any section to be rotated independently about the vertical axis and hold each section securely in place to prevent misalignment.

Terminal Block

One five-position terminal block with "fast-on" tabs on one side and screw clamps on the other side is provided. Mounting points for a second block are also present. Raised letters cast into the housing identify each position on the terminal block.

Reversible Door Mounting

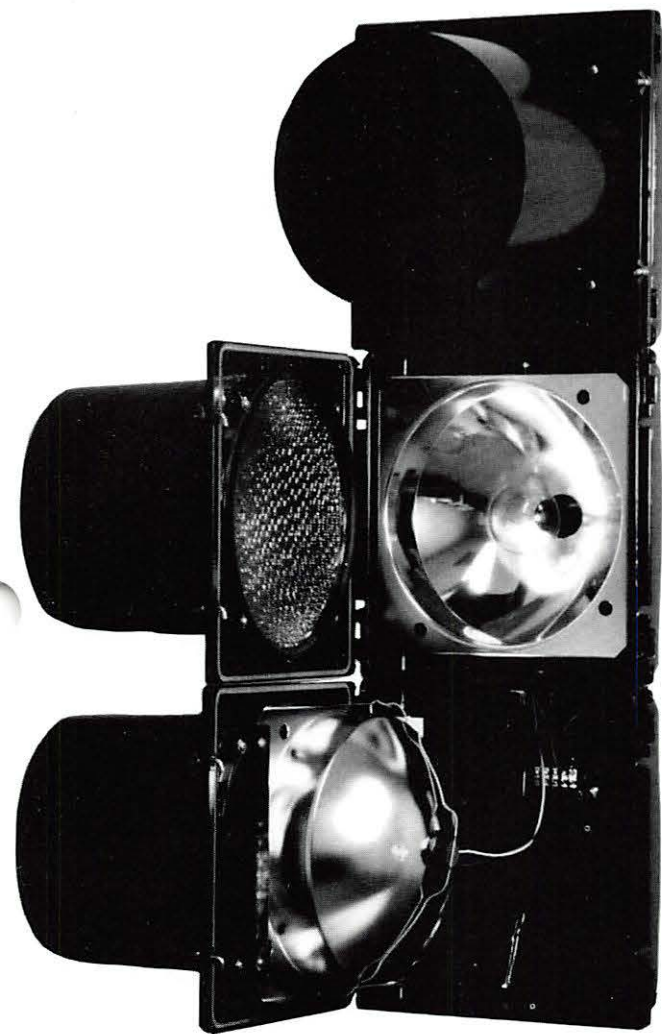
Door may be mounted on either side, permitting easy access to closely mounted signals. This makes it ideal for cluster mounted signals. Two integrally cast hinge lugs and latch screw slots are located on each side of the housing. Through a symmetrical concept each housing is capable of providing either right- or left-hand door opening. Left hinge is standard; right hinge is optional and must be specified.

Versatility

The 12-inch section may be used vertically or horizontally as a single section beacon or in combination with 8-inch sections and even with most other manufacturers' signals. Flat back housing often simplifies mounting for special applications. A complete line of visors, louvers and backplates is available.

Design Features

(Hydroformed Reflector)

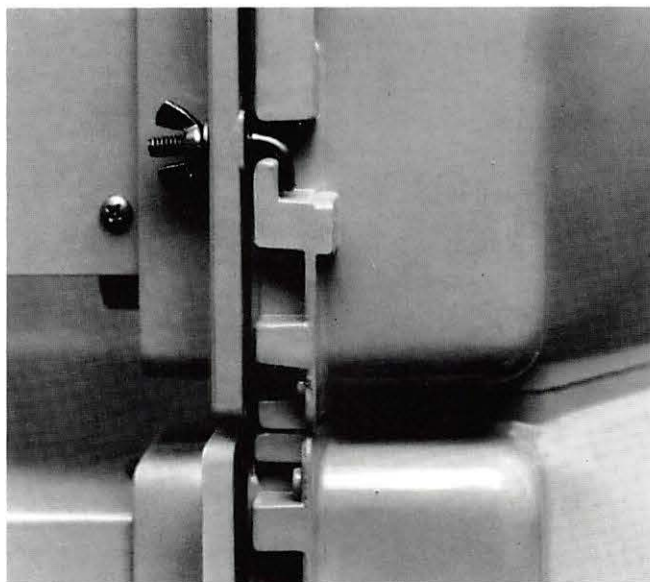


Prefocused Reflector and Lamp Mount

Unitized specular alzak aluminum reflector and phenolic lamp receptacle are "prefocused" for optimum optical performance. Lamp receptacle rotates for proper filament orientation. A bail holds the lamp firmly in place. Two stainless steel hinge pins allow the reflector to be swung open for easy maintenance, and compression spring permits fast removal without any tools.

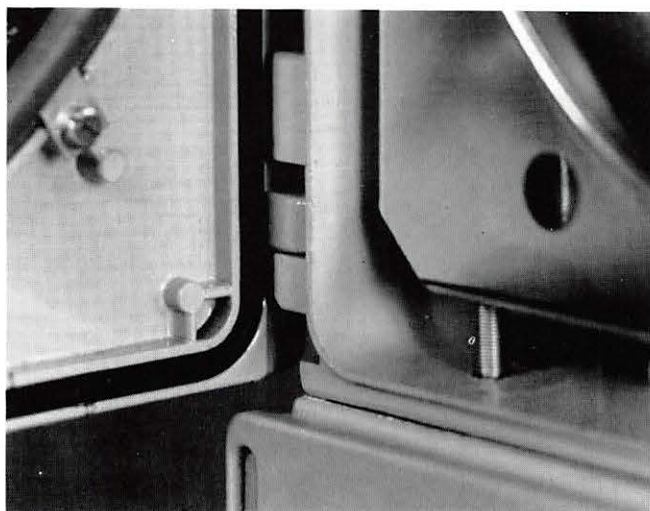
Housing

Computer assisted design of the signal head door and housing assure maximum strength with minimum weight for all stress points within the door-housing assembly. Housing ends, Shurlock bosses, hinge points, and fastener seat areas are all optimally designed to make the assembly one of the strongest signal head housings ever constructed.



Wing Nut Fasteners

Stainless steel "L" shaped wing nut fasteners were selected after testing numerous fastening methodologies. This specially engineered fastener permits opening of the door assembly, even if heavily coated with ice and snow. Fastener "breaks free" quickly from the housing with minimum effort and use of only one hand. The twin "L" fasteners also assure uniform pulldown of the door, gasket, and housing for positive seal.



Gusseted Gasket Channels

Positively captured gasket channel adds strength to the door in addition to providing correct alignment of gasket when closing the door to achieve higher integrity in weatherproofing.

Specifications

12-Inch Aluminum Signal Head

General

Each traffic signal head shall consist of a number of completely identical signal sections rigidly fastened together to present a continuous, pleasing appearance. Each section shall have a separate and complete housing. The traffic signal shall meet or exceed the Equipment Standard of the Institute of Transportation Engineers' (ITE) latest revision.

Housing

The housing of each section shall be a one-piece corrosion resistant aluminum alloy die-casting. Two integrally cast hinge lugs and two integrally cast latch screw slots shall be on each side of the housing. Through a symmetrical concept each housing shall be capable of providing either right- or left-hand door opening. Left hinged is standard; right hinged is special and must be specified. The top and bottom of the housing shall have an opening to accommodate standard 1-1/2 inch pipe brackets. Each signal section shall be rigidly attached, one above the other, by means of corrosion resistant bolts and attaching washers in such a manner that any section may be rotated about a vertical axis and oriented with respect to an adjacent section.

The top and bottom opening of the signal housing shall have a Shurlock boss integrally cast into the housing. The radial angular grooves of the Shurlock boss, when used with Shurlock fittings, shall provide positive 5-degree increment positioning of the entire signal head to eliminate rotation or misalignment of the signal. Each housing shall have cast bosses for two five-position terminal blocks. Each position shall be identified with both number and function cast on housing. The back of each housing shall have the manufacturer's name clearly displayed. Each housing shall have provisions for easily adding a back plate. Hinge pins, door latching hardware, visor backplate, and lens clip screws shall be high quality stainless steel.

Housing Door

The housing door of each section shall be a one-piece, corrosion resistant, aluminum alloy die casting. Two hinge lugs shall be cast on one side of the door, and two latch points shall be cast on the other side. The door shall be attached to the housing by means of two hinge pins. The door shall be easily removable without the use of tools. Two latch screws and wing

nuts on one side of the door shall provide for opening and closing the signal door without the use of any special tools. A gasket groove on the inside of the door shall accommodate a weatherproof and mildewproof resilient gasket which, when the door is closed, shall seal against a raised bead on the housing, making a positive seal. The outer face of the door shall have four holes equally spaced about the circumference of the lens opening, with four screws to accommodate the signal head visors. The door shall have at least two index points to enable easy positive orientation of the lens. The door and visor shall overlap 1/2 inch to prevent light escaping between visor and door (visor collar).

Optical System

Lens. The prisms traffic signal lens shall be standard red, yellow, or green and shall conform to the latest revision of the ITE standard specifications. The lens shall fit into a specially designed, slotted, extruded, and bonded full-circle EPDM lens gasket designed to fit the housing door in such a manner so as to exclude moisture, dust, and road film. The lens and gasket shall be secured to the door with four aluminum lens clips and stainless steel screws. The lenses shall be polycarbonate or glass, as specified.

Reflector. The reflector assembly consists of a glass-filled polycarbonate reflector ring and spun alzak aluminum reflector (or optional unitized hydroformed alzak aluminum reflector). The assembly shall be pivoted in the signal housing on two stainless steel pins in such a manner that it can be easily swung open for servicing the unit. The entire assembly is easily removed for maintenance or service without the use of any tools.

Lamp Receptacle. The prefocused, molded phenolic lamp receptacle is equipped with a lamp grip to prevent the lamp working loose due to vibration. The receptacle may be rotated to allow proper orientation of lamp filament.

Bail. The bail shall be a zinc-plated piano wire assembly that secures and orients the socket to the reflector.

Wiring

Each receptacle shall be provided with two leads with "fast-on" type terminals. Wires shall be color coded per customer specifications.

Lamp receptacle conductors shall be No. 18 AWG, or larger, 600-volt appliance wiring material, which conform to Military Specification: MIL-W-16878 D, Type B, with a vinyl nylon jacket rated 115 degrees Centigrade.

Terminal Block

Each complete signal face shall be provided with a terminal block. The terminal block shall be placed in the bottom section unless otherwise specified. The terminal block for a standard three-section head shall be a five-position, ten-terminal, barrier-type strip. To one side of each "fast-on" terminal strip shall be attached the AC common, red, yellow, and green signal section leads, leaving the opposite screw-clamp terminal for field wires.

Visors

Visors shall be tunnel, full-circle or cap, and a minimum of 9-1/2 inches long. Visors shall be formed of corrosion-resistant aluminum alloy sheet. They shall have twist-on attaching tabs to facilitate installation.

Painting

All interior and exterior parts of the housing, door, backplate, and visor shall be pretreated for painting in the following stages: degrease, hot rinse, etch with an iron phosphate solution, hot rinse, chemical seal, and dry for at least 10 minutes at 300 degrees Fahrenheit. The parts shall then be painted with a single coat of environmentally safe, ultraviolet resistant, polyester powder coating, which shall be applied electrostatically at 90 kV and baked for 20 minutes at 375 degrees Fahrenheit per ASTM D-3359, ASTM D-3363 and ASTM D-522. The signal head color shall be specified by the customer, except the inside of the visor and the front side of the backplate shall be painted dull black.

Standard colors are:

Dark olive green — shall match Federal Standard 595a-14056

Yellow — shall match Federal Standard 595a-13538

Dull Black — shall match Federal Standard 595a-37038

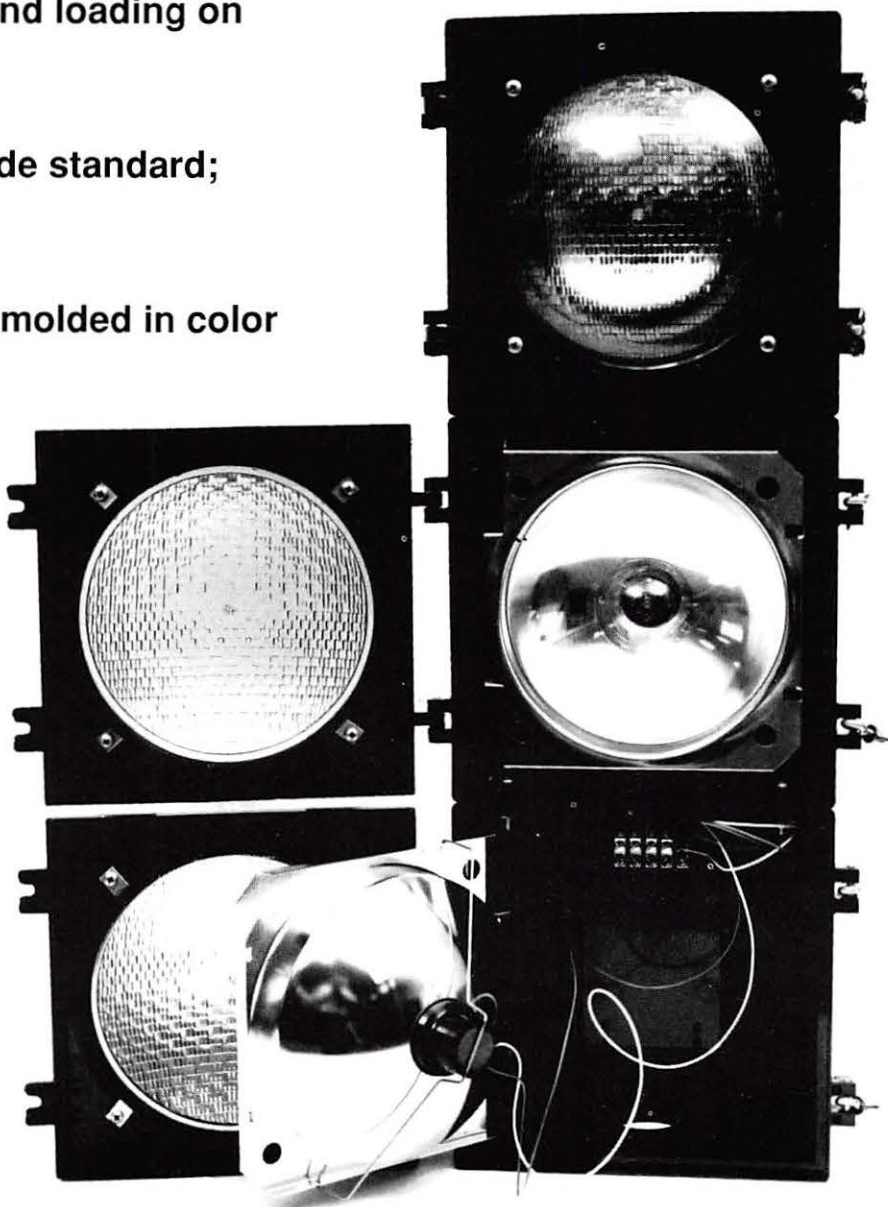
Stainless steel latching devices shall not be painted.

920914

8-Inch Polycarbonate Signal Head

Features

- Tested to ITE required wind loading on single point attachment
- Reversible door — left side standard; right side optional
- Lower maintenance with molded in color
- Stainless steel hardware
- Doors equipped with two latches
- "Fast-on" tab terminal block
- Provisions for two, five-position terminal blocks in each housing
- EPDM or optional red silicone lens gasketing



Specifications

8-Inch Polycarbonate Signal Head

General

Each traffic signal head shall consist of a number of completely identical signal sections rigidly fastened together to present a continuous, pleasing appearance. Each section shall have a separate and complete housing. The traffic signal shall meet or exceed the Equipment Standard of the Institute of Transportation Engineers' (ITE) latest revision.

Housing

The housing of each section shall be a one-piece molded ultraviolet and heat stabilized polycarbonate unit. Two integrally cast hinge/screw lugs shall be cast on each side of the housing. Through a symmetrical concept each housing shall be capable of providing either right- or left-hand door opening. Left hinged is standard; right hinged is special and must be specified. The top and bottom of the housing shall have an opening to accommodate standard 1-1/2 inch pipe brackets. Each signal section shall be rigidly attached, one above the other, by means of corrosion resistant bolts and attaching washers in such a manner that any section may be rotated about a vertical axis and oriented with respect to an adjacent section. An alternate means for attaching sections together shall be available. It shall consist of four matching punchout locations, top and bottom of each section, to allow the sections to be bolted together with four 1-1/2" x 10-32 corrosion resistant screws. The top and bottom of the signal housing shall have a Shurlock boss integrally cast into the housing. The radial angular grooves of the Shurlock boss, when used with Shurlock fittings, shall provide positive 5-degree increment positioning of the entire signal head to eliminate rotation or misalignment of the signal. Each housing shall have cast bosses for two five-position terminal blocks. The back of each housing shall have the manufacturer's name clearly displayed. Each housing shall have provisions for easily adding a back plate. Hinge pins, door latching hardware, visor backplate, and lens clip screws shall be high quality stainless steel.

Housing Door

The housing door of each section shall be a one-piece molded ultraviolet and heat stabilized polycarbonate unit. Two hinge lugs shall be cast on one side and two latch jaws shall be cast on the other side. The door shall be attached to the housing by means of two stainless steel hinge pins. Two stainless steel latch screws and wing nuts on one side of the door shall provide for opening and closing the signal door without the use of any special tools. A gasket groove on the inside of the door shall accommodate a weatherproof and mildew-proof resilient gasket which, when the door is closed, shall seal flat against the housing, making a positive seal. The outer face of the door shall have four metal threaded inserts equally spaced about the circumference of the lens opening, with four screws to accommodate the signal head visors. The door and visor shall overlap 3/16 inch to prevent light escaping between visor and door (visor collar).

Optical System

Lens - The prisms traffic signal lens shall be standard red, yellow, or green and shall conform to the latest revision of the ITE standard specifications. The lens shall fit into a specially designed, slotted, extruded, and bonded full-circle lens gasket designed to fit the housing door in such a manner so as to exclude moisture, dust, and road film. The lens and gasket shall be secured to the door with four aluminum lens clips and stainless steel screws. The lenses shall be polycarbonate or glass, as specified.

Reflector - The reflector assembly consists of a unitized hydroformed alzak aluminum reflector. The assembly shall be pivoted in the signal housing on two cast-in polycarbonate tension supports in such a manner that it can be easily swung open for servicing the unit. The entire assembly is easily removed for maintenance or service without the use of any tools.

Lamp Receptacle - The prefocused, molded phenolic lamp receptacle is equipped with a

lamp grip to prevent the lamp working loose due to vibration. The receptacle may be rotated to allow proper orientation of lamp filament.

Bail - The bail shall be a corrosion resistant piano wire assembly that secures and orients the socket to the reflector.

Wiring - Each receptacle shall be provided with two leads with "fast-on" type terminals. Wires shall be color coded per customer specifications.

Lamp receptacle conductors shall be No. 18 AWG, or larger, 600-volt appliance wiring material, which conforms to Military Specification MIL-W-16878 D, Type B, with a vinyl nylon jacket rated 115 degrees Centigrade.

Terminal Block - Each complete signal face shall be provided with a terminal block. The terminal block shall be placed in the bottom section unless otherwise specified. The terminal block for a standard three-section head shall be a five-position, ten-terminal, barrier-type strip. To one side of each "fast-on" terminal strip shall be attached the AC common, red, yellow, and green signal section leads, leaving the opposite screw-clamp terminal for field wires.

Visors - Visors shall be tunnel, full-circle or cap, and a minimum of 8 inches long. Visors shall be molded from ultraviolet and heat stabilized polycarbonate. They shall have twist-on attaching tabs to facilitate installation.

Color - The housing and door shall be molded of one-color polycarbonate material throughout. The inside of yellow visors shall be painted lusterless black. The stainless steel parts shall not be painted.

Standard colors are:

Dark olive green — shall match Federal Standard 595a-14056

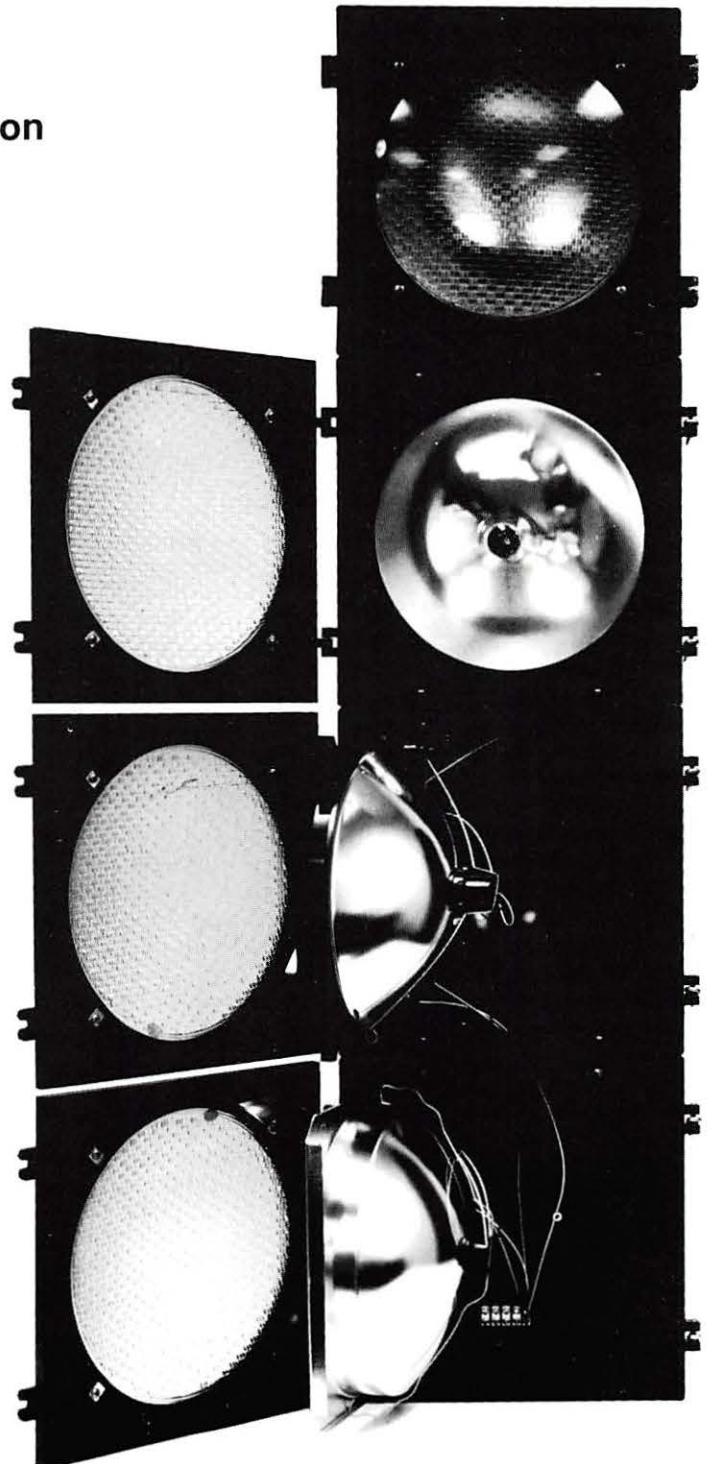
Yellow — shall match Federal Standard 595a-13538

Dull Black — shall match Federal Standard 595a-37038

12-Inch Polycarbonate Signal Head

Features

- Tested to ITE required wind loading on single point attachment
- Reversible door — left side standard; right side optional
- Lower maintenance with molded in color
- Stainless steel hardware
- Doors equipped with two latches
- "Fast-on" tab terminal block
- Provisions for two, five-position terminal blocks in each housing
- EPDM or optional red silicone lens gasketing
- Optional hydraformed reflector



Specifications

12-Inch Polycarbonate Signal Head

General

Each traffic signal head shall consist of a number of completely identical signal sections rigidly fastened together to present a continuous, pleasing appearance. Each section shall have a separate and complete housing. The traffic signal shall meet or exceed the Equipment Standard of the Institute of Transportation Engineers' (ITE) latest revision.

Housing

The housing of each section shall be a one-piece molded ultraviolet and heat stabilized polycarbonate unit. Two integrally cast hinge/screw lugs shall be cast on each side of the housing. Through a symmetrical concept each housing shall be capable of providing either right- or left-hand door opening. Left hinged is standard; right hinged is special and must be specified. The top and bottom of the housing shall have an opening to accommodate standard 1-1/2 inch pipe brackets. Each signal section shall be rigidly attached, one above the other, by means of corrosion resistant bolts and attaching washers in such a manner that any section may be rotated about a vertical axis and oriented with respect to an adjacent section. An alternate means for attaching sections together shall be available. It shall consist of four matching punchout locations, top and bottom of each section, to allow the sections to be bolted together with four 1-1/2" x 10-32 corrosion resistant screws. The top and bottom of the signal housing shall have a Shurlock boss integrally cast into the housing. The radial angular grooves of the Shurlock boss, when used with Shurlock fittings, shall provide positive 5-degree increment positioning of the entire signal head to eliminate rotation or misalignment of the signal. Each housing shall have cast bosses for two five-position terminal blocks. The back of each housing shall have the manufacturer's name clearly displayed. Each housing shall have provisions for easily adding a back plate. Hinge pins, door latching hardware, visor backplate, and lens clip screws shall be high quality stainless steel.

Housing Door

The housing door of each section shall be a one-piece molded ultraviolet and heat stabilized polycarbonate unit. Two hinge lugs shall be cast on one side and two latch jaws shall be cast on the other side. The door shall be attached to the housing by means of two stainless steel hinge pins. Two stainless steel latch screws and wing nuts on one side of the door shall provide for opening and closing the signal door without the use of any special tools. A gasket groove on the inside of the door shall accommodate a weatherproof and mildew-proof resilient gasket which, when the door is closed, shall seal flat against the housing, making a positive seal. The outer face of the door shall have four metal threaded inserts equally spaced about the circumference of the lens opening, with four screws to accommodate the signal head visors. The door and visor shall overlap 3/16 inch to prevent light escaping between visor and door (visor collar).

Optical System

Lens - The prisms traffic signal lens shall be standard red, yellow, or green and shall conform to the latest revision of the ITE standard specifications. The lens shall fit into a specially designed, slotted, extruded, and bonded full-circle lens gasket designed to fit the housing door in such a manner so as to exclude moisture, dust, and road film. The lens and gasket shall be secured to the door with four aluminum lens clips and stainless steel screws. The lenses shall be polycarbonate or glass, as specified.

Reflector - The reflector assembly consists of a glass-filled polycarbonate reflector ring and spun alzak aluminum reflector (or optional unitized hydroformed alzak aluminum reflector). The assembly shall be pivoted in the signal housing on two cast-in polycarbonate tension supports in such a manner that it can be easily swung open for servicing the unit. The entire assembly is easily removed for maintenance or service without the use of any tools.

Lamp Receptacle - The prefocused, molded phenolic lamp receptacle is equipped with a

lamp grip to prevent the lamp working loose due to vibration. The receptacle may be rotated to allow proper orientation of lamp filament.

Bail - The bail shall be a corrosion resistant piano wire assembly that secures and orients the socket to the reflector.

Wiring - Each receptacle shall be provided with two leads with "fast-on" type terminals. Wires shall be color coded per customer specifications.

Lamp receptacle conductors shall be No. 18 AWG, or larger, 600-volt appliance wiring material, which conforms to Military Specification MIL-W-16878 D, Type B, with a vinyl nylon jacket rated 115 degrees Centigrade.

Terminal Block - Each complete signal face shall be provided with a terminal block. The terminal block shall be placed in the bottom section unless otherwise specified. The terminal block for a standard three-section head shall be a five-position, ten-terminal, barrier-type strip. To one side of each "fast-on" terminal strip shall be attached the AC common, red, yellow, and green signal section leads, leaving the opposite screw-clamp terminal for field wires.

Visors - Visors shall be tunnel, full-circle or cap, and a minimum of 10 inches long. Visors shall be molded from ultraviolet and heat stabilized polycarbonate. They shall have twist-on attaching tabs to facilitate installation.

Color - The housing and door shall be molded of one-color polycarbonate material throughout. The inside of yellow visors shall be painted lusterless black. The stainless steel parts shall not be painted.

Standard colors are:

Dark olive green — shall match Federal Standard 595a-14056

Yellow — shall match Federal Standard 595a-13538

Dull Black — shall match Federal Standard 595a-37038

VEHICLE TRAFFIC SIGNALS ORDERING INSTRUCTIONS

Model Number Example:	E	A	31	G	3	A	P	E	1	B
	1	2	3	4	5	6	7	8	9	10

<u>Symbol/ Number</u>	<u>Description</u>	<u>Options</u>
1	Head type	E = 8" T = 12" C = Combination
2	Head material	A = Aluminum P = Polycarbonate
3	Face arrangement	Refer to page V-0
4	Signal color	G = Green housing w/green door & visor Y = Yellow housing w/yellow door & visor B = Gloss black housing w/gloss black door & visor F = Flat black housing w/flat black door & visor C = Yellow housing w/flat black door & visor V = Green housing w/flat black door & visor X = Specify housing, door, & visor colors
5	Terminal block location	0 = No terminal block 1 = Mounted in top section 2 = Mounted in middle section or second section from top 3 = Mounted in bottom section
6	Reflector	A = Alzak (reflector ring assembly) G = Glass H = Hydroformed
7	Lens	P = Polycarbonate (standard) G = Glass
8	Lens gasket type	E = EPDM (standard) S = Silicone
9	Elevator plumbizer location	0 = No plumbizer or Arm 1 = Between top and 2nd sections 2 = Between 2nd and 3rd sections 3 = Between 3rd and 4th sections 4 = Between 4th and 5th sections
10	Elevator Plumbizer material	A = Aluminum elevator plumbizer B = Bronze elevator plumbizer N = No Plumbizer or Arm

If mighty mount is to be used, consult factory for ordering instructions.

BACKPLATE ORDERING INFORMATION

One Piece

Description	8" (EA/EP) - 5" Border		12" (TA/TP) - 5" Border	
	ABS	Aluminum	ABS	Aluminum
Standard w/o EP	E1570P4*	E1572P4*._**	E1590P4*	E1592P4*._**
Louvered "		E1672P4*._**		E1692P4*._**
Standard with EP	E2500P4*	E2502P4*._**	E1595P4*	E1597P4*._**
Louvered "		E2602P4*._**		E1697P4*._**

Description	8" (EA/EP) - 8" Border		12" (TA/TP) - 8" Border	
	ABS	Aluminum	ABS	Aluminum
Standard w/o EP	E1580P4*	E1582P4*._**	E1518P4*	E1574P4*._**
Louvered "		E1682P4*._**		E1674P4*._**
Standard with EP	E2510P4*	E2512P4*._**	E1519P4*	E1584P4*._**
Louvered "		E2612P4*._**		E1684P4*._**

*Number of signal sections

**Color Numbers for Aluminum Backplates

11 = Green/flat black	31 = Green/green
12 = Yellow/flat black	32 = Yellow/yellow
13 = Gloss black/flat black	33 = Gloss black/gloss black
14 = Flat black/flat black	39 = Special color/special color
19 = Special color/flat black	

ABS backplates are flat black on both sides

Polycarbonate backplates are also available. Consult factory for ordering information.

BACKPLATE ORDERING INFORMATION

Two Piece

Description	8" (EA/EP) - 5" Border		12" (TA/TP) - 5" Border	
	ABS	Aluminum	ABS	Aluminum
Standard w/o EP	E1570G*	E1572G*.-**	E1590G*	E1592G*.-**
Louvered "		E1672G*.-**		E1692G*.-**
Standard with EP	E2500G*	E2502G*.-**	E1595G*	E1597G*.-**
Louvered "		E2602G*.-**		E1697G*.-**

Description	8" (EA/EP) - 8" Border		12" (TA/TP) - 8" Border	
	ABS	Aluminum	ABS	Aluminum
Standard w/o EP	E1580G*	E1582G*.-**	E1518G*	E1574G*.-**
Louvered "		E1682G*.-**		E1674G*.-**
Standard with EP	E2510G*	E2512G*.-**	E1519G*	E1584G*.-**
Louvered "		E2612G*.-**		E1684G*.-**

Three-Inch Borders (Aluminum only)

Description	Standard	Louvered
Cluster Mount without elevator plumbizer	E1593G*.-**	E1693G*.-**
Cluster Mount with elevator plumbizer	E1598G*.-**	E1698G*.-**
Cluster Mount with astrobracket	E1579G*.-**	E1679G*.-**

*Number of signal sections

**Color Numbers for Aluminum Backplates

- | | |
|-------------------------------|----------------------------------|
| 11 = Green/flat black | 31 = Green/green |
| 12 = Yellow/flat black | 32 = Yellow/yellow |
| 13 = Gloss black/flat black | 33 = Gloss black/gloss black |
| 14 = Flat black/flat black | 39 = Special color/special color |
| 19 = Special color/flat black | |

ABS backplates are flat black on both sides.

Polycarbonate backplates are also available. Consult factory for ordering information.

BACKPLATE ORDERING INFORMATION

Combination - 5" Borders (CA/CP)

CA/CP Head Configuration	One Piece		Two Piece	
	ABS	Aluminum	ABS	Aluminum
31,35,36 w/o EP, standard	E1585P41	E1587P41-**	E1585G1	E1587G1-**
3,135,36 w/o EP, louvered		E1687P41-**		E1687G1-**
31,35,36 w/EP, standard	E1575P41	E1577P41-**	E1575G1	E1577G1-**
3,135,36 w/EP, louvered		E1677P41-**		E1677G1-**
37,38 w/o EP, standard	E1585P42	E1587P42-**	E1585G2	E1587G2-**
37,38 w/o EP, louvered		E1687P42-**		E1687G2-**
37,38 w/EP, standard	E1575P42	E1577P42-**	E1575G2	E1577G2-**
37,38				
46 w/o EP, standard	E1585P43	E1587P43-**	E1585G3	E1587G3-**
46 w/o EP, louvered		E1687P43-**		E1687G3-**
46 w/EP, standard	E1575P43	E1577P43-**	E1575G3	E1577G3-**
46 w/EP, louvered		E1677P43-**		E1677G3-**
47 w/o EP, standard	E1585P48	E1587P48-**	E1585G8	E1587G8-**
47 w/o EP, louvered		E1687P48-**		E1687G8-**
47 w/EP, standard	E1575P48	E1577P48-**	E1575G8	E1577G8-**
47 w/EP, louvered		E1677P48-**		E1677G8-**
56,59 w/9 EP, standard	E1585P44	E1587P44-**	E1585G4	E1587G4-**
56,59 w/o EP, louvered		E1687P44		E1687G4-**
56,59 w/EP, standard	E1575P44	E1577P44-**	E1575G4	E1577G4-**
56,59 w/EP, louvered		E1677P44		E1677G4-**

****Color Numbers for Aluminum Backplates**

11 = Green/flat black
 12 = Yellow/flat black
 13 = Gloss black/flat black

14 = Flat black/flat black
 19 = Special color/flat black
 31 = Green/green

32 = Yellow/yellow
 33 = Gloss black/gloss black
 39 = Special color/special color

ABS backplates are flat black on both sides.

Polycarbonate backplates are also available. Consult factory for ordering information.

BACKPLATE ORDERING INFORMATION

Combination - 5" Borders (CA/CP)

CA/CP Head Configuration	One Piece		Two Piece	
	ABS	Aluminum	ABS	Aluminum
48 w/o EP, standard	E1585P45	E1587P45-**	E1585G5	E1587G5-**
48 w/o EP, louvered		E1687P45-**		E1687G5-**
48 w/EP, standard	E1575P45	E1577P45-**	E1575G5	E1577G5-**
48 w/EP, louvered		E1677P45-**		E1677G5-**
55 w/o EP, standard	E1585P47	E1587P47-**	E1585G7	E1587G7-**
55 w/o EP, louvered		E1687P47		E1687G7-**
55 w/EP, standard	E1575P47	E1577P47-**	E1575G7	E1577G7-**
55 w/EP, louvered		E1677P47		E1677G7
56,59 W/O EP, standard	E1585P44	E1587P44-**	E1585G4	E1587G4-**
56,59 w/o EP, louvered		E1687P44		E1687G4-**
56,59 w/EP, standard	E1575P44	E1577P44-**	E1575G4	E1577G4-**
56,59 w/EP, louvered		E1677P44		E1677G4-**
57 w/o EP, standard	E1585P46	E1587P46-**	E1585G6	E1587G6-**
57 w/o EP, louvered		E1687P46-**		E1687G6-**
57 w/EP, standard	E1575P46	E1577P46-**	E1575G6	E1577G6-**
57 w/EP, louvered		E1677P46-**		E1677G6-**

****Color Numbers for Aluminum Backplates**

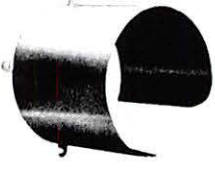
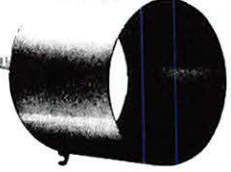
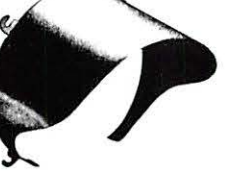
11 = Green/flat black	31 = Green/green
12 = Yellow/flat black	32 = Yellow/yellow
13 = Gloss black/flat black	33 = Gloss black/gloss black
14 = Flat black/flat black	39 = Special color/special color
19 = Special color/flat black	

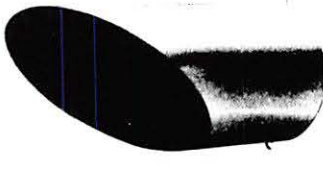
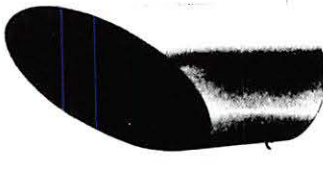
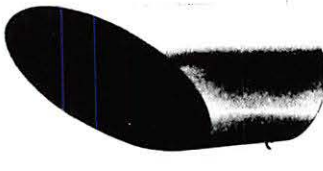
ABS backplates are flat black on both sides.

Polycarbonate backplates are also available. Consult factory for ordering information.

STANDARD VISORS FOR VEHICLE SIGNALS (EA & TA Series)

Tab Type (with Ears) Mounting

Visor Description			
	Tunnel	Full Circle	Cap
8" aluminum - 7" long (ITE standard)*	E8260P1**	E8280P1**	E8270P1**
8" aluminum - 8" long	E8260P2* **	E8280P2* **	----
8" aluminum - 11" long	E8260P4* **	E8280P4* **	----
12" alum. - 9-1/2" long (ITE standard)*	E8265P1**	E8285P1**	E8275P1**
12" aluminum - 11" long	E8265P3**	E8285P3**	----
12" aluminum - 12" long	E8265P4**	E8285P4**	----

Visor Description				
	8" Left Angle	12" Left Angle	8" Right Angle	12" Right Angle
Aluminum - 8" x 18"	E8281P1**	E8286P1**	E8282P1**	8287P1**
Aluminum - 12" x 27"	E8281P2**	E8286P2**	E8282P2**	E8287P2**

*Consult factory

** (Outside color: -11 = green; -12 = yellow; -13 = gloss black; -14 = flat black; -19 = specify color)

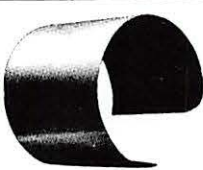
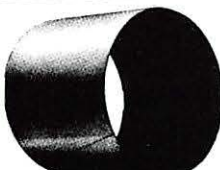
All visors are black on inside surface.

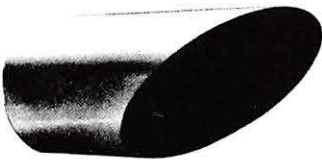
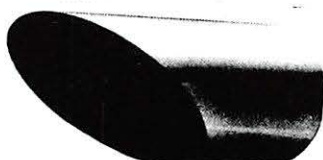
Tab and bayonet visors are not interchangeable. For replacement parts, check signal head to determine which visor mounting you need.

Louvers are shown on page V-7.

VISORS & LOUVERS FOR VEHICLE SIGNALS (EA & TA Series)

Bayonet Type Mounting

Visor Description			
	Tunnel	Full Circle	Cap
8" aluminum - 7" long (ITE standard)*	E8160P1**	E8180P1**	E8170P1**
8" aluminum - 8" long	E8160P2**	E8180P2**	----
8" aluminum - 12" long	E8160P4**	E8180P4**	----
12" alum. - 9-1/2" long (ITE standard)*	E8165P1**	E8185P1**	E8175P1**
12" aluminum - 12" long	E8165P4**	E8185P4**	----

Visor Description				
	8" Left Angle	12" Left Angle	8" Right Angle	12" Right Angle
Aluminum - 8" x 18"	E8181P1**	E8186P1**	E8182P1**	E8187P1**
Aluminum - 12" x 27"	E8181P2**	E8186P2**	E8182P2**	E8187P2**

Description	
8" louver, directional, 6-vane with 3' cutoff right of center. Rotate louver 180° for 3' cutoff left of center. All flat black.	E1520P2
8" louver, directional, 3-vane with 7' cutoff right of center. Rotate louver 180° for 7' cutoff left of center. All flat black.	E1500P2
12" louver, directional, 5-vane with 7' cutoff right of center. Rotate louver 180° for 7' cutoff left of center. All flat black.	53561P2

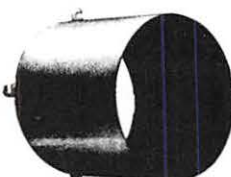
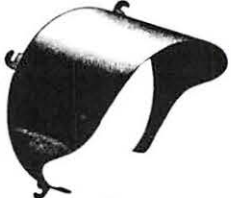
**Outside color: -11 = green; -12 = yellow; -13 = gloss black; -14 = flat black; -19 = specify color

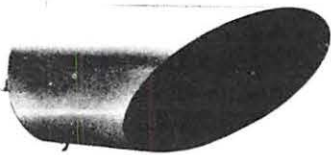
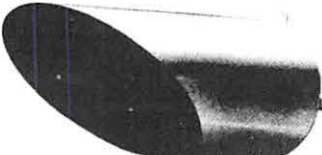
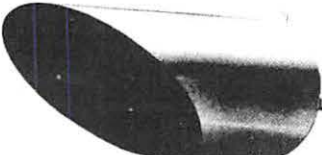
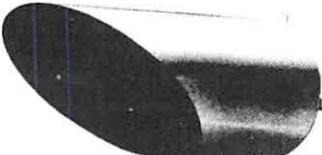
All visors are black on inside surface.

Bayonet and tab visors are not interchangeable. For replacement parts, check signal head to determine which visor mounting you need.

VISORS FOR VEHICLE SIGNALS ALUMINUM (E, T, EP & TP Series)

Tab Type (with Ears) Mounting

Visor Description			
	Tunnel	Full Circle	Cap
8" aluminum - 8" long	E8260P2**	E8280P2**	E1530*
12" aluminum - 11" long	E8265P3**	E8285P3**	E1540*
12" aluminum - 16" long	E1545*	----	----
8" polycarbonate - 8" long	EP1529*	EP1509*	EP1530*
12" polycarbonate - 10" long	EP1542*	EP1541*	EP1540*

Visor Description				
	8" Left Angle	12" Left Angle	8" Right Angle	12" Right Angle
Aluminum - 8" x 18"	E1512*	E1547*	E1515*	E1546*
Aluminum - 8" x 24"	E1533*	----	E1534*	----
Aluminum - 12" x 27"	----	E1549*	----	E1548*

*Outside color: P2 = green; P3 = yellow; P4 = flat black; P5 = gloss black; X = specify color

**Outside color: 11 = green; 12 = yellow; 13 = gloss black; 14 = flat black; 19 = specify color

All visors are black on inside surface.

NOTE: New type visors (8200 series) will fit on old aluminum or poly heads. However, the length could be different if replacing one visor on existing head.

Louvers are shown on page V-7.

REPLACEMENT PARTS

Vehicle Lenses (Meets or exceeds ITE specifications)



Figure 1



Figure 2

Figure	Description	Part Number	
		8"	12"
1	Polycarbonate lens, red ball	E4665P1	E4668P1
1	Polycarbonate lens, yellow ball	E4665P2	E4668P2
1	Polycarbonate lens, green ball	E4665P3	E4668P3
2	Polycarbonate lens, red arrow	----	E4669P1*
2	Polycarbonate lens, yellow arrow	----	E4669P2*
2	Polycarbonate lens, green arrow	----	E4669P3**
1	Glass lens, red ball	E4655P1	E4955P1
1	Glass lens, yellow ball	E4655P2	E4955P2
1	Glass lens, green ball	E4655P3	E4955P3
2	Glass lens, red arrow	----	E4960P1
2	Glass lens, yellow arrow	----	E4960P2
2	Glass lens, green arrow	E4710P3	E4960P3

*Specify L for left arrow, R for right arrow.

**Specify L for left arrow, R for right arrow, or V for vertical arrow.

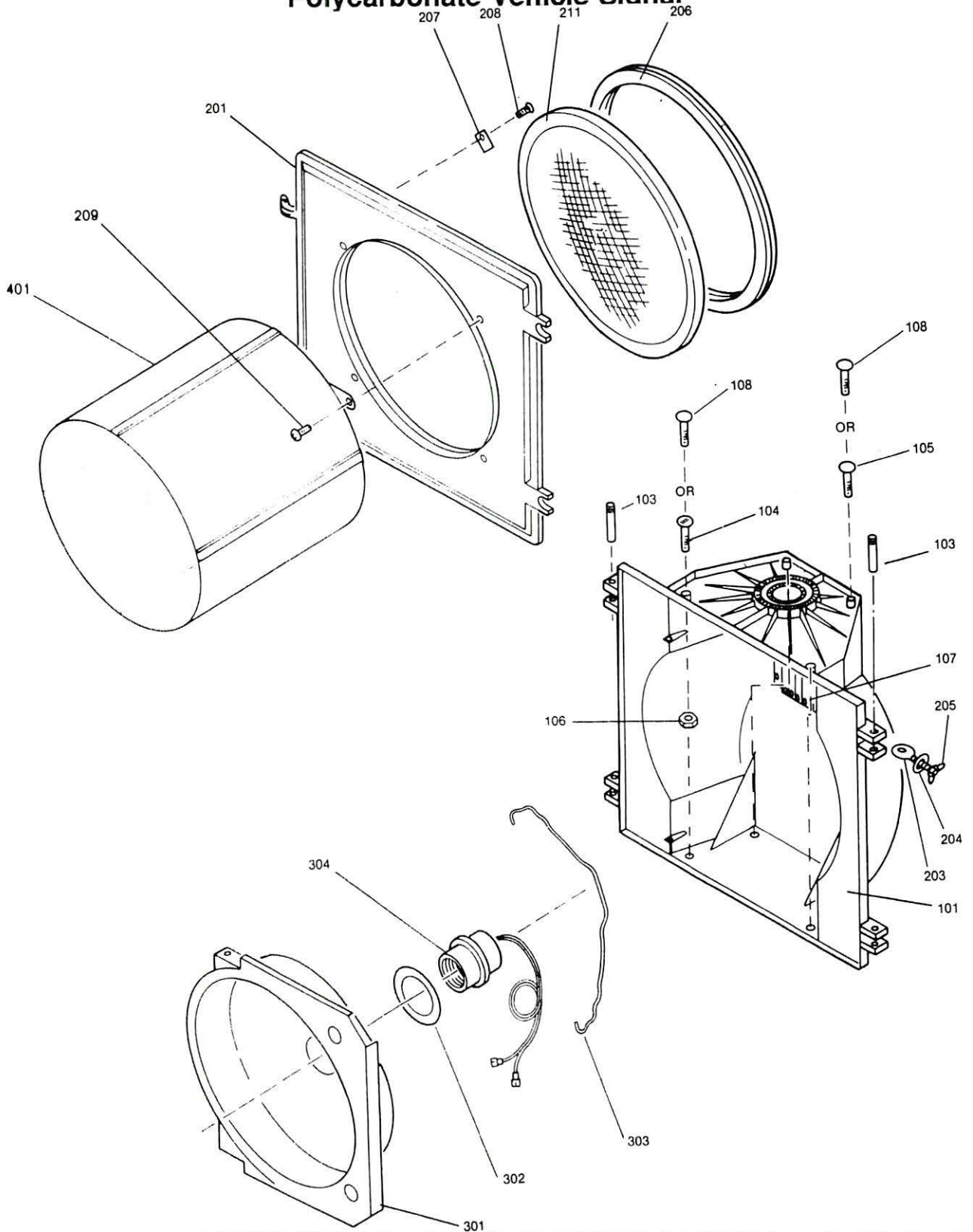
REPLACEMENT PARTS Aluminum Vehicle Signals (EA & TA Series)

Figure	Description	8"	12"
101	Housing	E8340P2*	E8395P2*
102	Pin, straight, reflector hinge	E8378P3	E8378P6
103	Pin, straight, door hinge	E8378P1	E8378P1
104	Washer, attaching for signal housing	E985P1	E985P1
105	Bolt, attaching for signal housing	E986P5	E986P5
106	Nut/washer, attaching for signal housing	N256P21B	N256P21B
107	Terminal block, 5-position quick disconnect	44699P5	44699P5
108	Screw, terminal block, self tapping	E8399P2	E8399P2
109	Spring reflector	E8380P2	E8380P1
110	Spring spacer	E8392P2	E8392P1
201	Door, drilled for tab type visor	E8350P3*	E8355P3*
202	Door gasket	E8152P1	E8152P2
203	Bolt, latching "L"	E8386P1	E8386P1
204	Washer, flat latching	E8396P1	E8396P1
205	Nut wing, latching	E8394P1	E8394P1
206	Gasket, lens, EPDM	31548P1	31552P1
206	Gasket, lens, silicone	31548P2	31552P2
207	Clip, lens	E990P1	E990P1
208	Screw, lens clip	E8200P1	E8200P1
209	Screw, visor	E8210P1	E8210P1
210	Pin, door "L" hinge	E8390P1	E8390P1
211	Lens	See page V-9	
301	Reflector, alzak	E8310P1	E8315P1
301	Reflector, glass	E8320G1	E8325G1
301	Ring, reflector** (part of 3 piece assembly)	----	E8305P1
301	Reflector, alzak** (part of 3 piece assembly)	----	E8319P1
302	Gasket, socket/reflector, fiber velumoid	E8384P3	E8384P3
303	Bail, reflector** (part of 3 piece assembly)	----	E8339P1
303	Bail, reflector	E8331P1	E8335P1
304	Socket assembly - red leads	E8360G230	E8365G240
304	Socket assembly - yellow leads	E8360G430	E8365G440
304	Socket assembly - brown leads	E8360G130	E8365G140
401	Visor	See pages V-6, V-7	

*Color: -11 = green; -12 = yellow; -13 = gloss black; -14 = flat black; -19 = specify color

**Alternate design

REPLACEMENT PARTS Polycarbonate Vehicle Signal



REPLACEMENT PARTS Polycarbonate Vehicle Signals (EP & TP Series)

V-13

Figure	Description	Part Number	
		8"	12"
101	Housing, black	888001	888680
101	Housing, yellow	888028	888699
101	Housing, green	888036	888702
103	Pin, hinge and latch	E8378P7	E8378P7
104	Screw, attaching for signal housing	N80P17020B	N80P17024B
105	Screw, attaching for signal housing	N80P17024B	N80P17028B
106	Nut, attaching for signal housing	E8220P4B	E8220P4B
107	Terminal block, 5 position quick disconnect	44699P5	44699P5
108	Hole plug	44758P101	44758P101
201	Door, w/door gasket, black	888080	888746
201	Door, w/door gasket, yellow	888088	888754
201	Door, w/door gasket, green	888096	888762
203	Eye bolt, latching	E983P1	E983P1
204	Washer, flat, latching	E8396P1	E8396P1
205	Nut, wing, latching	E8394P1	E8394P1
206	Gasket, lens, EPDM	31548P1	31552P1
206	Gasket, lens, silicone	31548P2	31552P2
207	Clip, lens	E990P1	E990P1
208	Screw, lens clip	E8200P1	E8200P1
211	Lens	See page V-9	
301	Reflector, glass	E8320G2	E8325G2
301	Ring, reflector* (part of 3 piece assembly)	----	E8305P1
301	Reflector, alzak* (part of 3 piece assembly)	----	E8319P1
301	Reflector, alzak (hydroformed)	44849P1	44848P1
302	Gasket, socket/reflector, fiber velumoid	E8384P3	E8384P3
303	Bail, reflector* (part of 3 piece assembly)	----	E8339P1
303	Bail, reflector	E8331P1	E8335P1
304	Socket assembly - red leads	E8360G230	E8365G240
304	Socket assembly - yellow leads	E8360G430	E8365G440
304	Socket assembly - brown leads	E8360G130	E8365G140
401	Visor	See page V8	

*Alternate design

REPLACEMENT PARTS Backplates for Original E & T Series (Two-Piece Construction)

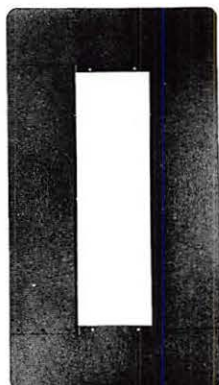


Figure 1

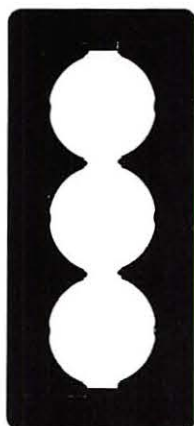


Figure 2

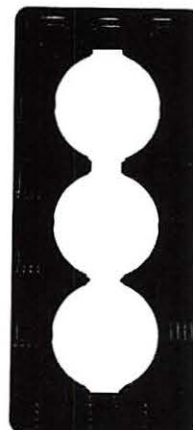


Figure 3

Figure	Description	Part Number	
		Black Front Green Back	Flat Black Both Sides
1	Backplate, 8" border, 8" signal face for E series	E1505G*	E1505G1*
2	Backplate, 5" border, for 12" signal face	E1551G*	E1551G1*
2	Backplate, 5" border, 3 section for 12" signal face equipped with elevator plumbizer	E1552G3	E1552G13
2	Backplate, 5" border, 4 section for 12" signal face equipped with elevator plumbizer between first and second section	E1552G4	E1552G14
2	Backplate, 5" border, 4 section for 12" signal face equipped with elevator plumbizer in center	E1552G6	E1552G16
2	Backplate, 5" border, 5 section for 12" signal face equipped with elevator plumbizer between second and third section	E1552G5	E1552G15
2	Backplate, 5" border, 4 section for 12" signal face equipped with elevator plumbizer between first and second section - Louvered	E1552G8	E1552G18
3	Backplate, 5" border, 3 section for 12" signal face equipped with elevator plumbizer-Louvered	E1552G7	E1552G17

*Number of sections (e.g., G3 means three sections)

REPLACEMENT PARTS **Backplates for Original C & SC Series** **(Two Piece Construction)**

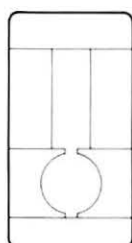


Figure 1

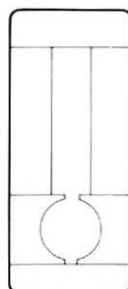


Figure 2

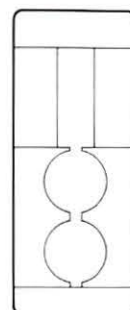


Figure 3

Figure	Description	Part Number	
		Black Front Green Back	Flat Black Both Sides
1	Backplate; two 8" sections, one 12" section for C31, C35, C36 face	E1554G1	E1554G11
2	Backplate; three 8" sections, one 12" section for C46 face	E1554G3	E1554G13
3	Backplate; three 8" sections, two 12" sections for C56 or C59 face	E1554G21	E1554G31

If required to be louvered, consult factory.

REPLACEMENT PARTS

Backplates for Original C & SC Series
With Elevator Plumbizer (Two Piece Construction)

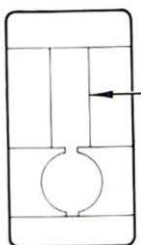


Figure 1

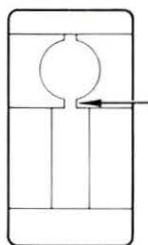


Figure 2

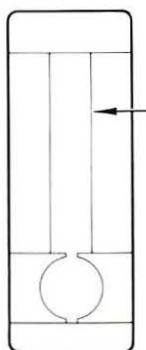


Figure 3

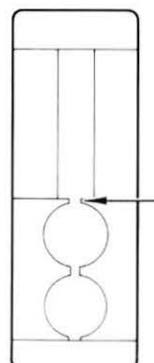


Figure 4

Figure	Description	Part Number	
		Black Front Green Back	Flat Black Both Sides
1	Backplate; two 8" sections, one 12" section for C35, face	E1555G1	E1555G11
2	Backplate; one 12" section, two 8" sections for C36 fact	E1555G2	E1555G12
3	Backplate; three 8" sections, one 12" section for C46 face	E1555G4	E1555G14
4	Backplate; three 8" sections, two 12" sections for C56 or C59 face	E1555G21	E1555G31

If required to be louvered, consult factory.

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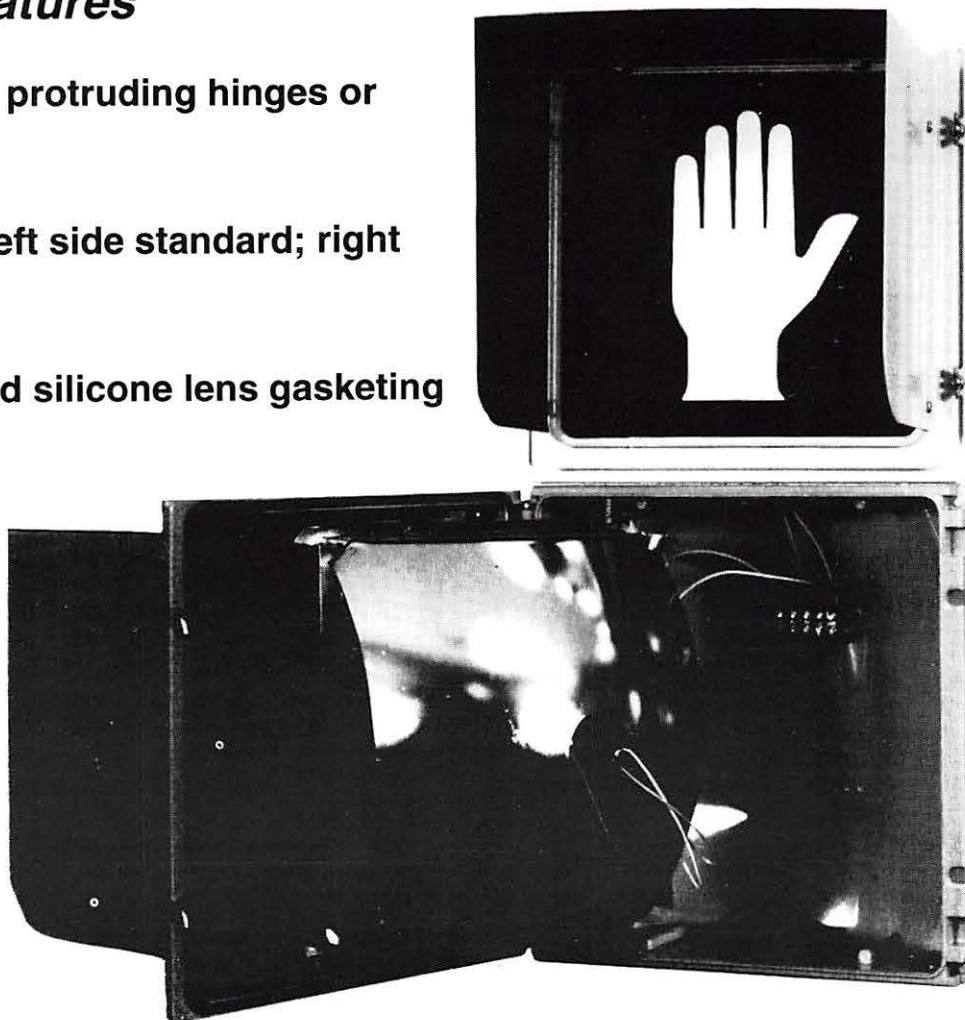
PEDESTRIAN SIGNALS

	<u>Page No.</u>
12" Incandescent Pedestrian Signals	P-1
Polycarbonate Incandescent Pedestrian Signals	P-2
Replacement Parts - 16" Aluminum Pedestrian Signals (PED16 Series)	P-3
Replacement Parts - 12" Aluminum Incandescent Pedestrian Signals (PED12 Series)	P-4
Replacement Parts - Pedestrian Lenses	P-6
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Replacement Parts - Pedestrian Pushbuttons	P-8
Pedestrian Pushbutton Signs - Porcelain Enamel	P-9

12-Inch Incandescent Aluminum Pedestrian Signal

Features

- Straight sides — No protruding hinges or latches
- Reversible door — left side standard; right side optional
- EPDM or optional red silicone lens gasketing
- Terminal block identifiers cast into housing
- "Fast-on" tab terminal block
- Doors equipped with two latches
- Stainless steel hardware
- Provisions for two, five-position terminal blocks in each housing
- Tested to over 80 mph wind loading on single point attachment



Specifications

12-Inch Aluminum Pedestrian Signal Head

General

Each pedestrian signal shall consist of two identical sections securely mounted one above the other with a "hand" symbol or "DONT WALK" message above and a "walking person" symbol or "WALK" message below. The symbols/messages displayed shall be for pedestrian traffic only and when illuminated, shall meet or exceed the latest revision of the Institute of Transportation Engineers' (ITE) Specifications

Housing

The housing of each section shall be a one-piece corrosion resistant aluminum alloy die-casting. Two integrally cast hinge lugs and two integrally cast latch screw slots shall be on each side of the housing. Through a symmetrical concept each housing shall be capable of providing either right- or left-hand door opening. Left hinged is standard; right hinged is special and must be specified.

The top and bottom of the housing shall have an opening to accommodate standard 1-1/2 inch pipe brackets. Each signal section shall be rigidly attached, one above the other, by means of corrosion resistant bolts and attaching washers in such a manner that any section may be rotated about a vertical axis and oriented with respect to an adjacent section.

The top and bottom opening of the signal housing shall have a Shurlock boss integrally cast into the housing. The radial angular grooves of the Shurlock boss, when used with Shurlock fittings, shall provide positive 5-degree increment positioning of the entire signal head to eliminate rotation or misalignment of the signal. Each housing shall have cast bosses for two five-position terminal blocks. Each position shall be identified with both number and function cast on housing. The back of each housing shall have the manufacturer's name clearly displayed. Each housing shall have provisions for easily adding a back plate. Hinge pins, door latching hardware, visor backplate, and lens clip screws shall be high quality stainless steel.

Housing Door

The housing door of each section shall be a one-piece, corrosion resistant, aluminum alloy die casting. Two hinge lugs shall be cast on one side of the door, and two latch points shall be cast on the other side. The door shall be attached to the housing by means of two hinge pins. The door shall be easily removable without the use of tools. Two latch screws and wing nuts on one side of the door shall provide for opening and closing the signal door without the

use of any special tools. A gasket groove on the inside of the door shall accommodate a weatherproof and mildewproof resilient gasket which, when the door is closed, shall seal against a raised bead on the housing, making a positive seal. The outer face of the door shall have four holes equally spaced about the circumference of the lens opening, with four screws to accommodate the signal head visors. The door shall have at least two index points to enable easy positive orientation of the lens. The door and visor shall overlap 1/2 inch to prevent light escaping between visor and door (visor collar).

Optical System

Lens. The lens shall be 12 x 12 inches, cross-hatched (on the back), with a visible area of 11 x 11 inches. All lenses shall be uniformly colored, true to size and form, free from streaks, wrinkles, chips or bubbles, that can in any way detract from their effectiveness. The lens and its associated optical components shall produce a bright, clear, sharp, evenly illuminated message, with a strong intense output in the direction of normal to the signal face.

The "HAND" symbol or "DONT WALK" message shall be on the surface of the portland orange lens as specified by the Institute of Traffic Engineers.

The "Walking Person" symbol or "Walk" message shall be on the surface of the white lens as specified by the Institute of Traffic Engineers.

All lenses shall mount into a specially designed, slotted, molded full-circle silicone lens gasket designed to press against the housing door so as to exclude moisture, dust, and road film. The lens and gasket shall be secured to the door with four aluminum lens clips and stainless steel screws which allow easy replacement. The lenses shall be polycarbonate or glass as specified.

Reflector. The reflector assembly consists of a unitized hydroformed alzak aluminum reflector. The assembly shall be pivoted in the signal housing on two stainless steel pins in such a manner that it can be easily swung open for servicing the unit. The entire assembly is easily removed for maintenance or service without the use of any tools.

Lamp Receptacle. The prefocused, molded phenolic lamp receptacle is equipped with a lamp grip to prevent the lamp working loose due to vibration. The receptacle may be rotated to allow proper orientation of lamp filament and shall be designed to accommodate all standard 75 to 100 watt, 2-7/16 inch light center traffic signal lamps.

Bail. The bail shall be a zinc-plated piano wire assembly that secures and orients the socket to the reflector.

Wiring

Each receptacle shall be provided with two leads with "fast-on" type terminals. Wires shall be color coded per customer specifications.

Lamp receptacle conductors shall be No. 18 AWG, or larger, 600-volt appliance wiring material, which conform to Military Specification: MIL-W-16878 D, Type B, with a vinyl nylon jacket rated 115 degrees Centigrade.

Terminal Block

Each complete signal face shall be provided with a terminal block. The terminal block shall be placed in the bottom section unless otherwise specified. The terminal block for a standard three-section head shall be a five-position, ten-terminal, barrier-type strip. To one side of each "fast-on" terminal strip shall be attached the orange and white signal section leads, leaving the opposite screw-clamp terminal for field wires.

Visors

Visors shall be tunnel, and a minimum of 7 inches long. Visors shall be formed of corrosion-resistant aluminum alloy sheet.

Painting

All interior and exterior parts of the housing, door, backplate, and visor shall be pretreated for painting in the following stages: degrease, hot rinse, etch with an iron phosphate solution, hot rinse, chemical seal, and dry for at least 10 minutes at 300 degrees Fahrenheit. The parts shall then be painted with a single coat of environmentally safe, ultraviolet resistant, polyester powder coating, which shall be applied electrostatically at 90 kV and baked for 20 minutes at 375 degrees Fahrenheit per ASTM D-3359, ASTM D-3363 and ASTM D-522. The signal head color shall be specified by the customer, except the inside of the visor and the front side of the backplate shall be painted dull black. Stainless steel latching devices shall not be painted.

Standard colors are:

Dark olive green — shall match Federal Standard 595a-14056

Yellow — shall match Federal Standard 595a-13538

Dull Black — shall match Federal Standard 595a-37038

12" INCANDESCENT PEDESTRIAN SIGNALS

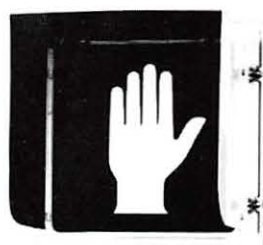


Figure 1



Figure 2

Figure	Description	Model Number
1	Aluminum signal, square polycarbonate lens, portland orange hand, white man	PED12A*
2	Aluminum signal, square polycarbonate lens, portland orange DONT WALK, white WALK	PED12B*

*Aluminum Signal Color: G = Green
Y = Yellow
B = Gloss black
F = Flat black
C = Yellow housing, flat black door and visor;
V = Green housing, flat black door and visor
X = Specify color

PED-2

POLYCARBONATE INCANDESCENT PEDESTRIAN SIGNALS



12" Ped Signal

Model Number Example:

109 2 1 1 1 81
123 4 5 6 7 89

<u>Symbol/ Number</u>	<u>Description</u>	<u>Options</u>
123	Ped Size	109 = 9" ped 114 = 12" ped
4	Sections	2 = Two sections
* 5	Color	1 = Yellow 2 = Black 3 = Dark green 4 = Yellow body, black door 7 = Specify color
6	Mounting	1 = Vertical 2 = Horizontal 3 = Vertical with stainless steel hinge pins
7	Cutaway	1 = Black 2 = Yellow 3 = Green
89	Message (Polycarbonate lens)	80 = WALK/DONT WALK 81 = U.S. Hand/Walking Man 89 = Canadian Hand/Walking Man

NOTE: Lane control lenses available - Consult your Econolite representative.

*9" available in black or green only.

REPLACEMENT PARTS 16" ALUMINUM PEDESTRIAN SIGNALS (PED16 Series)

Description	Part Number	
	Neon	Incandescent
Housing	E4341P31-**	
Door	E4351P11-**	
Reflector	-----	E4311P2
Lens, glass, U.S. symbol hand/man	-----	E4321P1
Lens, glass, Canadian symbols	-----	E4321P11
Window, polycarbonate	33171G1	-----
Neon ped assembly (tray, tubes, transformers)	33173G1	-----
Harness assembly	33179G1	-----
Fuse/switch block	54576P1	-----
Sunscreen	E4308G1	
Bracket, lamp retainer	-----	E4361P1
Clip, lens	-----	E990P2
Gasket, hand/man, EDPM sponge	E4373P1	
Gasket, neoprene	-----	57449P16
Socket assembly, violet leads	-----	E8367G717
Socket assembly, gray leads	-----	E8367G817
Tb Dbl 3 pos quick disconnect	44699P3	
Pin, "L," ped door	E8390P2	
Eye bolt	E983P2	
Wing nut	E8394P1	
Visor, hood	E4381P1-**	
Side mounting casting	E4345P2-**	
12-position terminal block	E2251P1	
Gasket	E8152P3	
Pin, "L," side mount	E8390P3	
Shoulder pin	E4397P1	
Hex bolt	E4365P1	

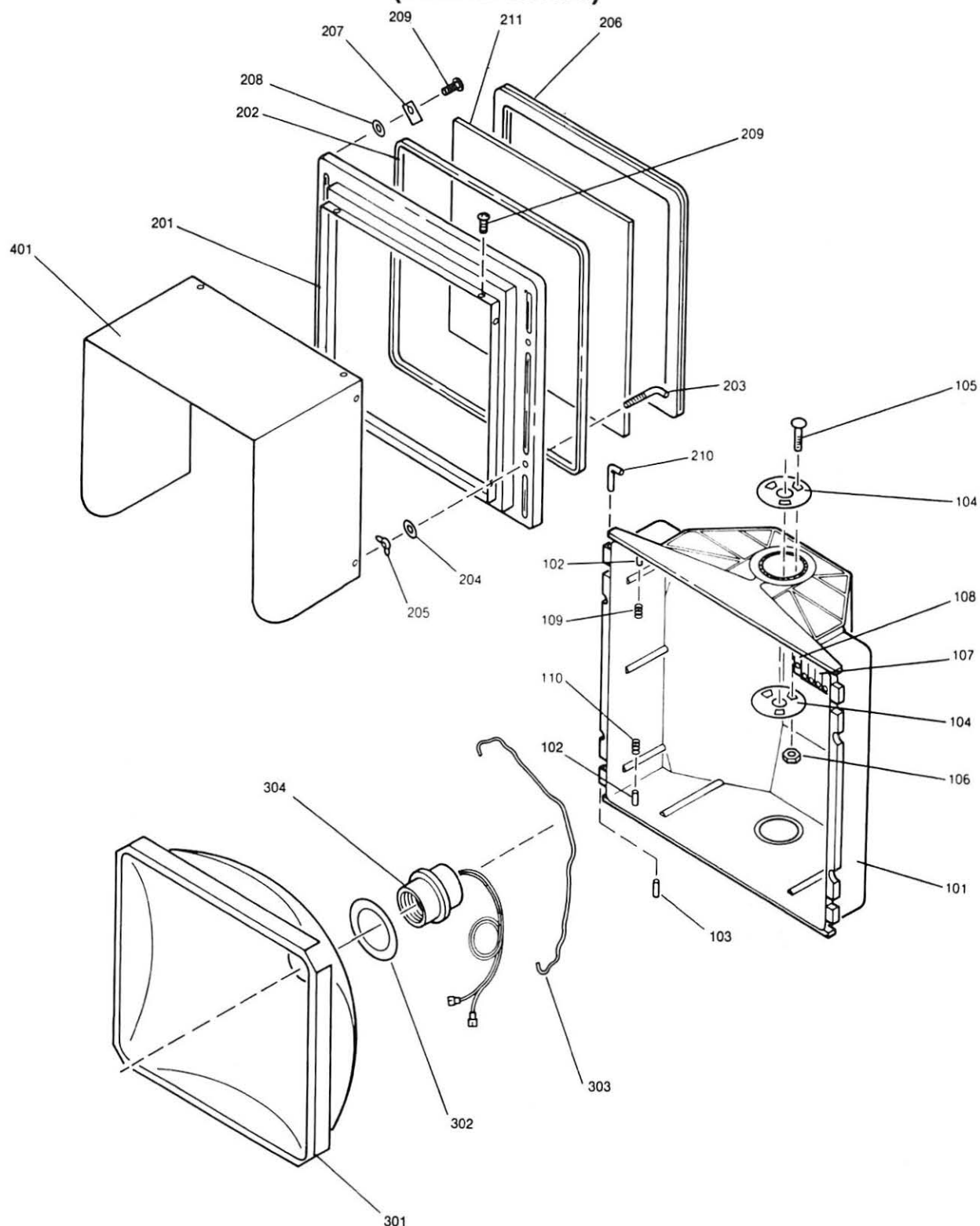
**Color: 11 = Green/flat black; 12 = Yellow/flat black; 13 = Gloss black/flat black;
14 = Flat black/flat black; 19 = Special color/flat black

PED-4**REPLACEMENT PARTS
12" ALUMINUM INCANDESCENT PEDESTRIAN SIGNALS
(PED12 Series)**

Figure	Description	Part Number
101	Housing, 12" pedestrian	E8395P12*
102	Pin, straight, reflector hinge	E8378P7
103	Pin, straight, door hinge	E8378P1
104	Washer, attaching for signal housing	E985P1
105	Bolt, attaching for signal housing	E986P5
106	Nut/washer, attaching for signal housing	N256P21B
107	Terminal block, 5-position quick disconnect	44699P5
108	Screw, terminal block, self tapping	E8399P2
109	Spring, reflector	E8380P1
110	Spring, spacer	E8392P1
201	Door	E8357P3*
202	Door gasket	E8152P2
203	Bolt, latching "L"	E8386P1
204	Washer, flat, latching	E8396P1
205	Nut, wing, latching	E8394P1
206	Gasket, lens, EPDM	E8375P1
207	Clip, lens	E8388P1
208	Washer	N405P39C
209	Screw, visor & lens clip	E8210P1
210	Pin, door "L" hinge	E8390P1
211	Lens	See page PED-6
301	Reflector, alzak	E8317P1
302	Gasket, socket/reflector, fiber velumoid	E8384P3
303	Bail, reflector	E8337P1
304	Socket assembly - red leads	E8367G224
304	Socket assembly - brown leads	E8367G124
401	Visor	E8195P1*

*Color: -11 = Green; -12 = Yellow; -13 = Gloss black; -14 = Flat black; -19 = Specify color

REPLACEMENT PARTS 12" ALUMINUM INCANDESCENT PEDESTRIAN SIGNALS (PED12 Series)



REPLACEMENT PARTS PEDESTRIAN LENSES (Meets or exceeds ITE specifications)



Figure 1

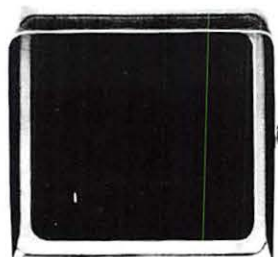


Figure 2

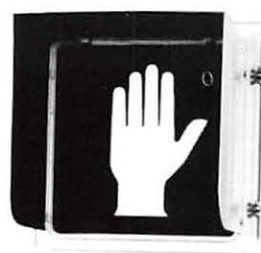


Figure 3



Figure 4



Figure 5

Figure	Description	8"	12"	16"
1	Polycarbonate lens, "DONT WALK," square, Portland orange	E4620P1	E4624P1	
2	Polycarbonate lens, "WALK," square, white	E4621P1	E4625P1	
3	Polycarbonate lens, "hand," square, Portland orange	----	E4624P2	
4	Polycarbonate lens, "man," square, white	----	E4625P2	
5	16" glass lens U.S. hand/man (incandescent)	----	----	E4321P1
5 (Similar to)	16" glass lens Canadian hand/man (incandescent)	----	----	E4321P11
5	Lexan window, neon	----	----	33171G1

PEDESTRIAN PUSHBUTTONS



Figure 1



Figure 2



Figure 3

Figure	Description	Model No.
1	Pushbutton, pedestrian, 2-1/2" pole top mounting for 5" x 7" sign	E3800G*
2	Pushbutton, pedestrian, side of 2-1/2" pole mounting for 5" x 7" sign	E3801G*
2	Pushbutton, pedestrian, side of 4" pole mounting for 5" x 7" sign	E3840G*
2	Pushbutton, pedestrian, side of 5" pole mounting for 5" x 7" sign	E3850G*
2	Pushbutton, pedestrian, side of 6" pole mounting for 5" x 7" sign	E3860G*
2	Pushbutton, pedestrian, side of 8" pole mounting for 5" x 7" sign	E3880G*
2	Pushbutton, pedestrian, side of 10" pole mounting for 5" x 7" sign	E3810G*
2	Pushbutton, pedestrian, side of 12" pole mounting for 5" x 7" sign	E3812G*
2	Pushbutton, pedestrian, flatback mounting for 5" x 7" sign	E3820G*
3	Pushbutton, pedestrian, side of 2-1/2" pole mounting for 9" x 12" sign	55246G11**
3	Pushbutton, pedestrian, side of 4" pole mounting for 9" x 12" sign	55246G12**
3	Pushbutton, pedestrian, side of 5" pole mounting for 9" x 12" sign	55246G13**
3	Pushbutton, pedestrian, side of 6" pole mounting for 9" x 12" sign	55246G14**
3	Pushbutton, pedestrian, side of 9-1/2" pole mounting for 9" x 12" sign	55246G16**

*Color: G1 = Green, G2 = Yellow, G3 = Gloss black, G4 = Aluminum

**Color: G = Green, Y = Yellow, B = Gloss black, A = Aluminum

Signs not included with pushbutton mountings. See page P-9 for signs.

PED-8

PEDESTRIAN PUSHBUTTONS



Figure 1



Figure 2



Figure 3



Figure 4

Figure	Description	Model No.
1	Pushbutton, round, 3" diameter, plain flat back	E3951G1*
2	Pushbutton, round, 3" diameter with 1/2" threaded conduit entrance through bottom	E3951G2*
2	Pushbutton, round, 3" diameter with 3/4" threaded conduit entrance through bottom	E3951G3*
3	Pushbutton, round, 3" diameter with 1/2" cable entrance in back for flat surface mounting.	E3951G4*
4	Pushbutton, round, 3" diameter with bushing and mounting bracket for round pole	E3951G5*

REPLACEMENT PARTS

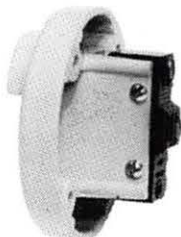


Figure 5

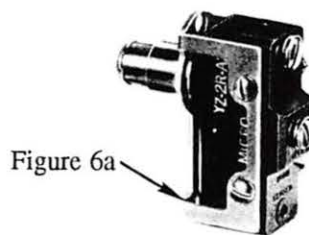
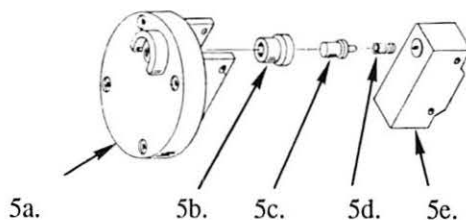


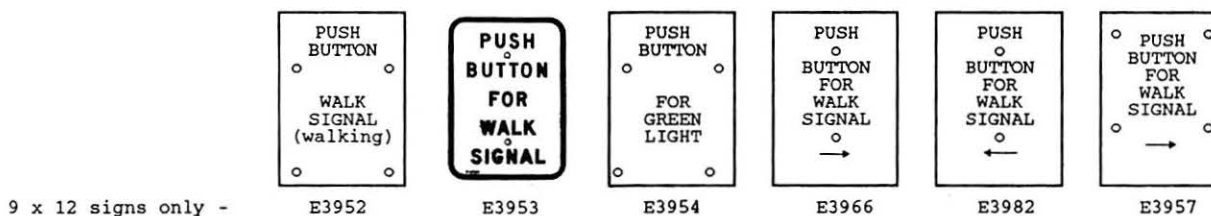
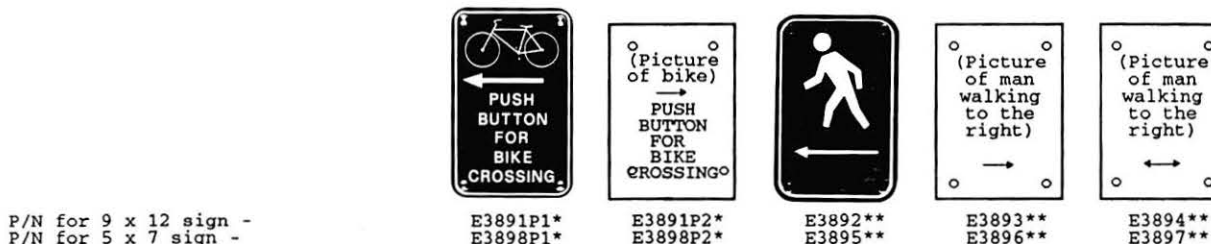
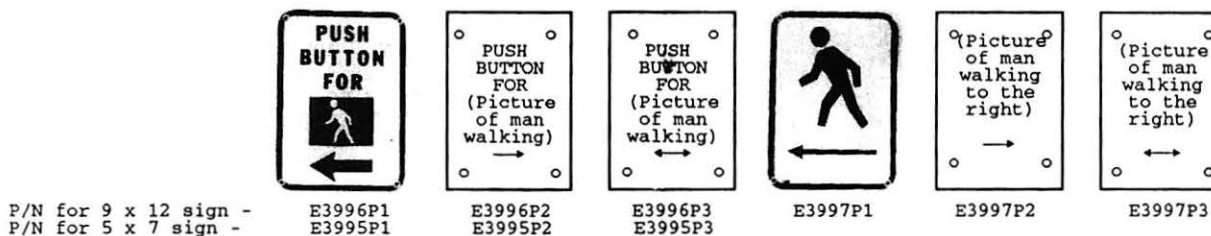
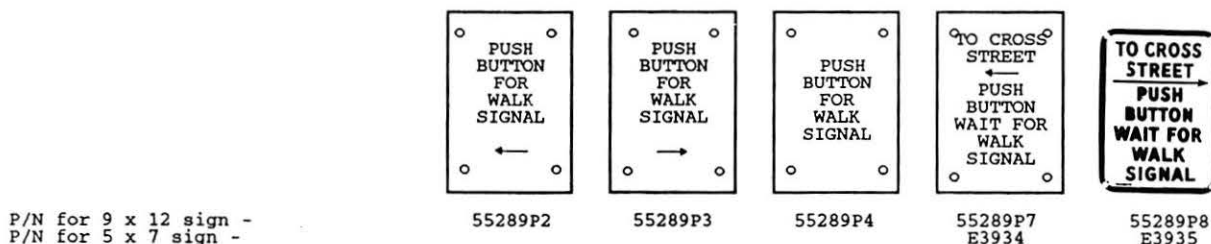
Figure 6

Figure	Description	Model No.
5	Pushbutton cap complete with microswitch assembly	E3903G1*
5a	Pushbutton cap only	E3902P2*
5b	Plunger bushing - plastic	31518P1
5c	Button assembly	E3904G1
5d	Compression spring	31514P1
5e	Microswitch	54466P1
6	Microswitch assembly for P/N 55246G	53385G1
6a	Actuator only for P/N 55246G	54467P2

*Color: G = Green, Y = Yellow, B = Gloss black, A = Aluminum

PEDESTRIAN PUSHBUTTON SIGNS - PORCELAIN ENAMEL

(All signs have white background with black legend unless otherwise noted)



*Green background with white legend
**Black background with white legend

Table of Contents

LED SIGNALS & SIGNS

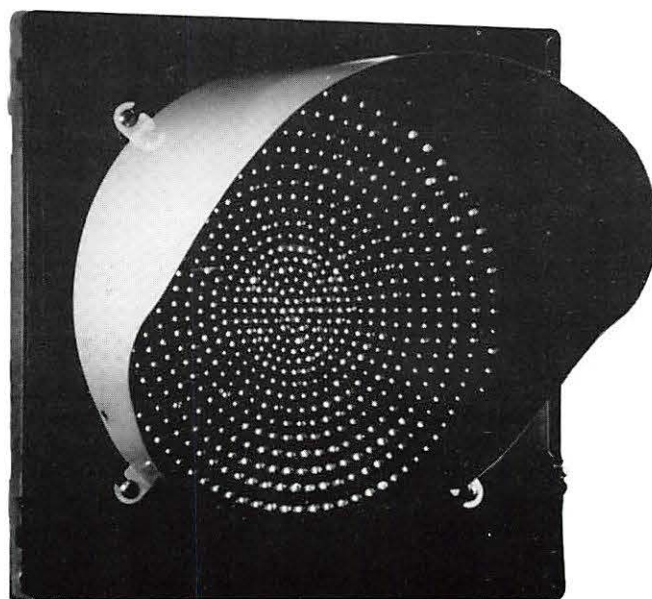
	<u>Page No.</u>
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LED 12" Red Signal & LED Retrofit Kit

Features

- Ultra-bright red LEDs
- Ultra-low 25 watt power consumption
- Ultra-reliable
- No annual maintenance
- 12" red signal section or LED retrofit kit
- Die-cast aluminum or polycarbonate housing
- Full set of signal head options
- Powered by 120 VAC
- 5-year warranty



Description

This signal head section uses a circuit board with 675 ultra-bright red LEDs to replace the lamp, socket and reflector assembly of a conventional 12" incandescent red signal head. It is powered directly by 120 VAC. When lit, it is nearly indistinguishable from its incandescent counterpart. Visibility is excellent, even in bright sunlight.

Dramatic power savings

Power consumption for the LEDs is only 25 watts, compared to the typical 150 watts for the incandescent bulb in a conventional signal head. At a 50% ON/OFF duty cycle, this represents a saving of 548 kWh per year. At a cost \$0.12/kWh for electricity and over the 5-year warranty period of the LED signal, this translates into a saving of \$329 for a single LED section.

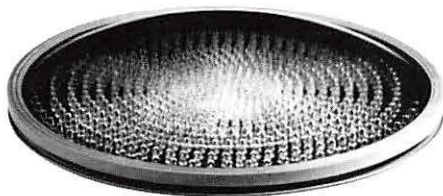
High reliability

The LEDs are extremely reliable and do not require scheduled annual maintenance, resulting in additional savings.

Life is nominally specified at 100,000 hours of continuous operation at rated brightness (nearly 12 years). There is no burnout mechanism as for incandescent bulbs. To further maximize reliability, the circuit is such that the loss of any individual LED will only deactivate a string of lights, not the entire signal section. High reliability, of course, is of special importance in case of the red signal indication.

Signal or retrofit kit

The LED 12" red signal is available as a complete signal head section or as a retrofit kit. The complete section is available in cast aluminum or polycarbonate, in a variety of housing colors, with a choice of visors, and with a choice of mounting options. The retrofit kit replaces the existing lamp, socket, reflector and red lens assembly of a conventional 12" incandescent signal head by Econolite or other manufacturers. It allows existing intersections to be upgraded at minimum labor and expense by utilizing signal housings which are already in place. Please contact Econolite for the list of signal heads that can be retrofitted.



Led retrofit kit to replace the lamp, socket, reflector and red lens assembly of a conventional 12" red signal section.

Specifications

LED 12" Signal Head Section

1. Introduction

This LED implementation of a red 12" signal head section shall be available as a complete signal head or as a retrofit kit for signal heads already in the field. When lit, the appearance of the LED version shall be similar to a red incandescent signal head in brightness and color.

2. Optical

The light emitting elements shall be 675 ultra-bright red LEDs with a typical light output of 600 mcd each. The LEDs shall be rated for 100,000 hours of continuous operation. The LEDs shall project light in a direction normal to the plane of the signal so that the half-brightness point relative to on-axis brightness is within $\pm 10^\circ$.

3. Electrical

The LED signal head shall be powered directly by 120 VAC, with electrical connection via quick-disconnect terminals. A stepdown transformer shall not be used. The LEDs shall be soldered in a circuit board and shall be wired in 9 parallel strings. The loss of any LED in a string shall only deactivate that string, not the entire signal head. Nominal power consumption for the LED signal shall be 25 W at 120 VAC.

4. Housing

The external signal head dimensions shall be 14" vertical by 14" horizontal by 8" deep. The housing shall be a one-piece, corrosion-resistant 360 aluminum alloy die casting or a polycarbonate molding, as specified, with integral bosses for stainless steel hinges and latching hardware. The top and bottom of the housing shall have a 2" opening with a Shurlock boss to accommodate standard 1 1/2" pipe brackets. The radial angular grooves of this boss, when used with Shurlock fittings, shall allow positive 5° increment alignment of the signal head. No externally protruding screws shall mar the mechanical integrity of the housing.

5. Housing door

The door shall be a one-piece, corrosion-resistant 360 aluminum alloy die casting or a polycarbonate molding, as specified, with appropriate bosses for hinges and latches. Stainless steel hinge and latch hardware shall allow easy opening/closing and attachment/removal of the door without the use of tools. A resilient gasket mounted in the door shall provide a positive environmental seal against external dirt and moisture when the door is closed. A clear 12" diameter lens in the door shall provide environmental protection for the LEDs and assure the desired viewing angle. It shall be made of shatterproof polycarbonate and shall be mounted in a molded, gapless EPDM gasket.

6. Painting

All exposed metal parts of the aluminum housing, door and visor (excluding stainless steel parts) shall be pre-treated for painting in the following stages: degrease, hot rinse, etch with an iron phosphate solution, hot rinse, chemical seal, and dry for at least 10 minutes at 300°F to 400°F. The parts shall then be painted with a single coat of environmentally safe, ultraviolet resistant, polyester powder coating, which shall be applied electrostatically at 90 kV and baked for 20 minutes at 375°F per ASTM D-3359, ASTM D-3363 and ASTM D-522. The following colors shall be standard:

Green - Federal Standard 595a-14056.
Yellow - Federal Standard 595a-13538.
Black - Federal Standard 595a-37038.

7. LED retrofit kit

The retrofit kit shall include an LED circuit board with 120 VAC spade lug connectors, a 12" diameter clear lens, and all hardware necessary to secure the circuit board and lens assembly to the signal head door. Retrofit kits shall be offered for 12" incandescent signal heads by Econolite and by other manufacturers (contact Econolite for list of signal heads that can be retrofitted).

Technical data

Dimensions .. 14" W x 14" H x 8 1/4" D
Weight, cast aluminum 10 lbs
Weight, polycarbonate 6 lbs
Weight, retrofit kit 2 lbs
Operating temperature:..... -35 to +75°C
Voltage, nominal 120 VAC
Voltage, range 95 to 135 VAC
Power consumption at 120 VAC... 25 W
Light output per LED, typ 600 mcd
Light output of signal head 405 cd
Number of LEDs..... 675

Signal ordering guide

Example: LTA11-G

Position 1: housing material

LTA11 = Aluminum housing
LTP11 = Polycarbonate housing

Position 2: color

G = Green housing & door
Y = Yellow housing & door
B = Gloss black housing & door
F = Flat black housing & door
C = Yellow housing w/ black door
V = Green housing w/ black door
A = Grey housing w/black door
X = Special color

Visor option

Order tunnel, full circle or cap visor as a separate line item.

LED retrofit kits

P/N 33200G1 For Econolite signals



ECONOLITE
CONTROL PRODUCTS, INC.

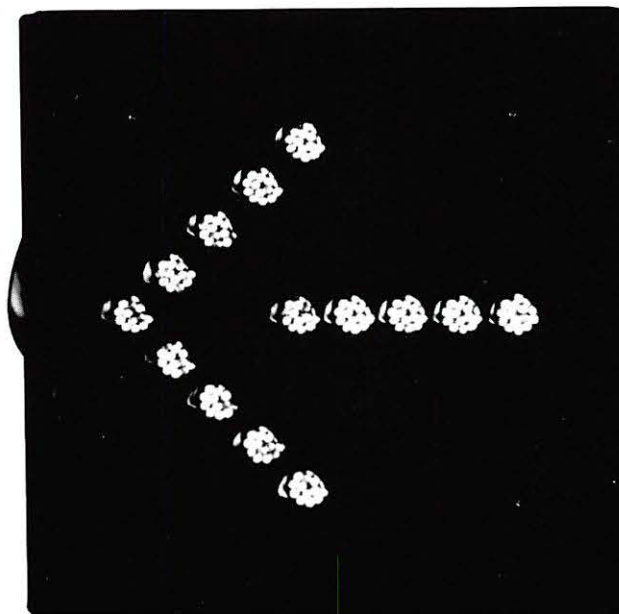
3360 E. La Palma Ave., Anaheim, CA 92806-2856
P.O. Box 6150, Anaheim, CA 92616-0150
Telephone: (714) 630-3700 FAX: (714) 630-6349

LED 12" Red Arrow Signals

(No right turn & no left turn)

Features

- Right- or left-pointing red arrow
- Ultra-bright one-inch LED pixels
- Highly energy efficient and reliable
- 120 VAC operation
- Standard 12" aluminum or polycarbonate signal housing



Description

These two red arrow signals use ultra bright one-inch red LED pixels for exceptional visual punch, low power consumption and the utmost in reliability. Their primary application is to replace red arrow sections in a 12" signal head. They can also be used singly to indicate turning prohibitions during peak traffic hours or in the face of oncoming rail traffic.

Bright LED pixels

The light-emitting elements are fourteen 1" diameter LED pixels, each consisting of 15 ultra-bright LED lamps. These are remarkably efficient in converting electrical energy into light, thus dramatically reducing energy costs compared to conventional light emitting technologies, such as incandescent or fiberoptics.

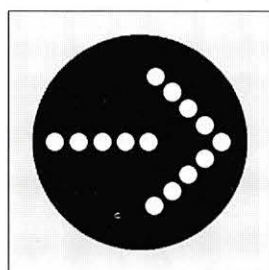
No light energy is lost through filtering, as red is a natural primary color of LEDs. Similarly, no light energy is lost through masking. Total power consumption is only 6.3 watts for the LED signal, result-

ing in substantial power savings over the incandescent alternative. For instance, the power savings alone would be \$580 over the 5-year warranty period of the LED signal, assuming a 135-watt lamp, a 90% ON/OFF duty cycle and a cost of \$0.12/kWh for electricity.

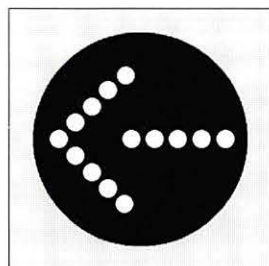
The LEDs are also extremely reliable and do not require scheduled annual maintenance. Their life is nominally specified at 100,000 hours of continuous operation (nearly 12 years). There is no burnout mechanism as for incandescent lamps.

12" signal head housing

These signals utilize a standard 12" signal head housing, which is available in die-cast aluminum or UV-resistant molded polycarbonate. The aluminum housing is electrostatically painted with a single coat of durable and environmentally safe polyester powder coating. All housing hardware is stainless steel. A wide range of housing colors, mounting options and visor options are available.



Model LT16R



Model LT16L

Specification

LED 12" red arrow signals

1. Introduction

Two signal versions shall be available, one with a right-pointing arrow and one with a left-pointing arrow. Both signals shall use ultra-bright one-inch red LED pixels for high visual punch, low power consumption and high reliability.

External signal head dimensions shall be 14" vertical by 14" horizontal by 8-1/4" deep. The red arrow shall measure 10" horizontal by 6.5" vertical.

2. LED pixels

The light emitting elements shall be 14 red LED pixels with a nominal diameter of one inch. Each pixel shall be protected against sunlight by a cap visor with a nominal depth of 1-1/4" as measured from the front of the LEDs.

The light output for each pixel shall be provided by 15 ultra-bright red LEDs each rated 600 mcd, for a total on-axis luminous intensity of 9 cd per pixel. The LEDs shall be rated for 100,000 hours of continuous operation.

The LED pixels shall be mounted in an aluminum panel, which shall be painted black. The only tools necessary for changing the pixels shall be a screwdriver and an 11/16" open-end wrench. Suitably-long lead wires shall be an integral part of each pixel.

The pixels shall be an Econolite model EBL-100-R or approved equal.

3. Electrical

The red arrow shall have a 120 VAC power connection via clearly labeled screw terminals. Nominal power consumption at 120 VAC shall be 6.3 watts.

4. Housing

The housing shall be a one-piece, corrosion-resistant, 360 aluminum alloy die casting.

Two integrally-cast hinge lugs and two integrally cast latch screw slots shall be on each side. The top and bottom of the housing shall have a 2" opening to accommodate standard 1 1/2" pipe brackets. Each opening shall have a Shurlock boss integrally cast into the housing. The radial angular grooves of this boss, when used with Shurlock fittings, shall allow positive 5° increment alignment of the signal head. No externally protruding screws shall mar the mechanical integrity of the housing.

5. Housing door

The door shall be a one-piece, corrosion resistant, 360 aluminum alloy die casting. Two hinge lugs shall be cast on one side, and two latch points shall be cast on the other side. The door shall be attached to the housing by means of stainless steel L-shaped hinge pins and L-shaped latch screws with wing nuts. This hardware shall allow easy opening/closing and attachment/removal of the door without the use of tools.

A resilient and mildewproof EPDM gasket shall be mounted in a groove inside the door and shall be compressed by a raised bead on the housing when the door is closed to provide a positive environmental seal against external dirt and moisture.

The base of each pixel shall be gasketed to form an environmental seal against a metal front panel, which shall be mounted in the door. No window or lens shall cover the front of the pixels.

6. Painting

All exposed metal parts of the housing, door and visor (excluding stainless steel parts) shall be pre-treated for painting in the following stages: degrease, hot rinse, etch with an iron phosphate solution, hot rinse, chemical seal, and dry for at least 10 minutes at 300°F to 400°F. The parts shall then be painted with a single coat of environmentally safe, ultraviolet resistant, polyester

powder coating, which shall be applied electrostatically at 90 kV and baked for 20 minutes at 375°F per ASTM D-3359, ASTM D-3363 and ASTM D-522. The following colors shall be standard:

Green - Federal Standard 595a-14056.
Yellow - Federal Standard 595a-13538.
Black - Federal Standard 595a-37038

Technical data

Dimensions .. 14" W x 14" H x 8 1/4" D	
Weight, aluminum.....	13 lbs
Weight, polycarbonate	6.5 lbs
Operating temperature:.....	-35 to +75°C
Voltage, nominal.....	120 VAC
Voltage, range	95 to 135 VAC
Power at 120 VAC	6.3 W

Ordering Guide

Example: LTA16R-G

Position 1: case material & arrow

LTA16R = aluminum, right arrow
LTA16L = aluminum, left arrow
LTP16R = polycarbonate, right arrow
LTP16L = polycarbonate, left arrow

Position 2: color

G = Green housing & door
Y = Yellow housing & door
B = Gloss black housing & door
F = Flat black housing & door
C = Yellow housing w/ black door
V = Green housing w/ black door
A = Gray housing w/ black door
X = Special color

Visor option

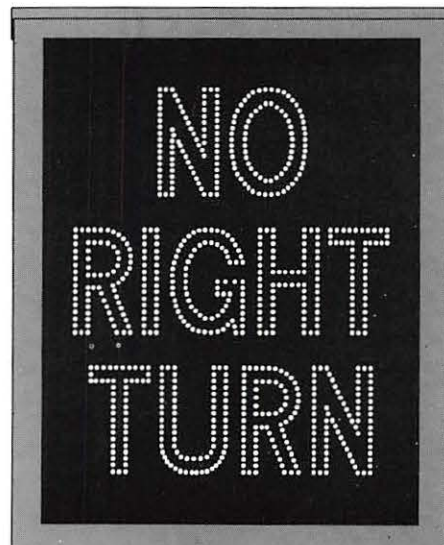
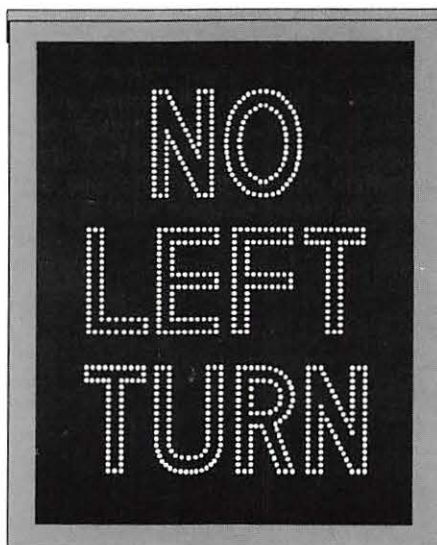
Order tunnel, full circle or cap visor as a separate line item.

NO LEFT TURN & NO RIGHT TURN

LED 24" x 30" Blankout Signs

Features

- Directional, ultra-bright red LEDs
- Highly energy efficient
- Extremely reliable
- Rugged aluminum housing
- Choice of mounting methods
- 5-year warranty



Description

When power is applied by the intersection controller, these signs display the message NO LEFT TURN or NO RIGHT TURN using brilliant red LEDs. In the absence of applied power, they present a blanked out black front panel.

Applications

Applications include access control to railroad crossings and to reversible traffic lanes as well as general turning prohibitions during peak traffic hours. In general, simple, electrically controlled messages are much easier for a motorist to interpret and hence are safer than complex painted signs such as "NO LEFT TURN 7 am to 9 am and 4 pm to 6 pm, Sundays and holidays excepted."

Ultra-bright LEDs

Ultra-bright red LEDs provide high visual punch, even in bright sunlight, as

their light output is monochromatic and directional. The 6" high by 4" wide characters are clearly visible from 360 feet.

Ultra-bright red LEDs are remarkably efficient in converting electrical energy into light, thus dramatically reducing energy costs. These 24" x 30" LED blankout signs only consume 24 watts of power when lit – substantially less than the 300 watts for a comparably-sized incandescent sign. At a 50% ON/OFF duty cycle and \$0.12/kWh for electricity, the power savings alone would be \$726 over the 5-year warranty period of a single LED sign.

LEDs are also extremely reliable and are recommended for critical applications. They do not require scheduled annual maintenance. There is no burn-out mechanism as for incandescent lamps. Life is nominally specified at 100,000 hours of continuous operation at rated brightness (nearly 12 years). The signs are so designed that they remain operational if an individual LED should fail.

Aluminum Housing

These blankout signs use a rugged, outdoor-rated, NEMA-3 style aluminum cabinet, which is electrostatically painted with durable and environmentally safe polyester powder coating. Mounting options include a mastarm plumbizer, spanwire hanger, or pole mounting. Holes are provided at the top and bottom of the cabinet for 1 1/2" Shurlock fittings, and stiffeners are provided on the back of the cabinet for attachment of pole mounting clamps. Mounting hardware is available in non-corrosive aluminum or bronze as well as painted malleable iron.

Technical Data

Dimensions: . 30" H x 24" W x 6" D
Operating temperature: -35 to +75°C
Voltage, nominal 120 VAC
Voltage, range 95 to 135 VAC
Power consumption, typ 24 W

Specifications

1. Introduction

In the absence of applied power, the blankout signs shall present a black front panel. When power is applied, the message NO LEFT TURN or NO RIGHT TURN shall be brilliantly displayed using directional, ultra-bright red LEDs. External dimensions shall be 24" x 30" x 6". The nominal character height shall be 6". For ease of servicing, each word shall be on its own circuit board.

2. Optical

The light emitting elements shall be ultra-bright red LEDs with a minimum light output of 600 mcd and shall be visible in sunlight. The LEDs shall be directional so as to project light toward the viewer. The half brightness point relative to on-axis brightness shall be within $\pm 10^\circ$.

The blankout signs shall be so designed that they are still usable in the event that an individual LED should fail and open a series circuit. There shall not be more than 15 LEDs in any series circuit, and adjacent LEDs shall belong to different circuits.

The lens protecting the LED sign shall be made of impact-resistant polycarbonate plastic. The outer surface of the lens shall be slightly frosted to minimize unwanted reflections.

3. Electrical

Each LED blankout sign shall have a 120 VAC power connection to the external controller via clearly-labeled screw ter-

minals. A power transformer shall be used to step down the incoming 120 VAC power, and the power connection shall be fused. Insulated pull tabs shall be provided so that the fuse can be removed, thereby implementing ON/OFF switch capability for the sign.

A 120 VAC input shall be provided to dim the sign by 50% for use at night.

4. Housing

The housing shall be a NEMA-3 type outdoor-rated cabinet made of 1/8" sheet aluminum. Mounting options shall include mastarm plumbizer, spanwire hanger, pole plates and pole clamps. Holes shall be provided at the top and bottom of the cabinet for 1 1/2" Shurlock fittings. Stiffeners shall be provided on the back of the cabinet for attachment of pole mounting clamps. Mounting hardware shall be available in non-corrosive aluminum or bronze as well as painted malleable iron.

5. Housing Door

The housing door shall hook into the housing at the top and shall be secured with two non-corrosive screws at the bottom. Once opened, the door shall latch in an approximately horizontal position to provide service access to the cabinet. The lens in the door shall be made of shatter-proof polycarbonate plastic and shall be lightly frosted to avoid unwanted reflections.

6. Painting

All exposed metal parts of the housing and door shall be pre-treated for painting in the following stages: degrease, hot rinse, etch with an iron phosphate solution, hot rinse, chemical sealing, and drying for at least 10

minutes at 300°F to 400°F. The parts shall then be painted with a single coat of environmentally safe, ultra-violet resistant, polyester powder coating, which shall be applied electrostatically at 90 kV and baked for 20 minutes at 375°F per ASTM D-3359, ASTM D-3363 and ASTM D-522. The cabinet color shall be as specified. The following colors shall be standard:

Green - 595a-14056

Yellow - Federal Standard 595a-13538

Dull black - Federal Standard 595a-37038

Ordering Guide

Example: LS24L-Y-2

Position 1: base model

LS24L = LED 24" wide blank-out sign

Position 2: housing color

G = Green
Y = Yellow
F = Flat black
B = Gloss black
U = Gray primer
X = Special color

Position 3: configuration

1 = NO LEFT TURN
2 = NO RIGHT TURN

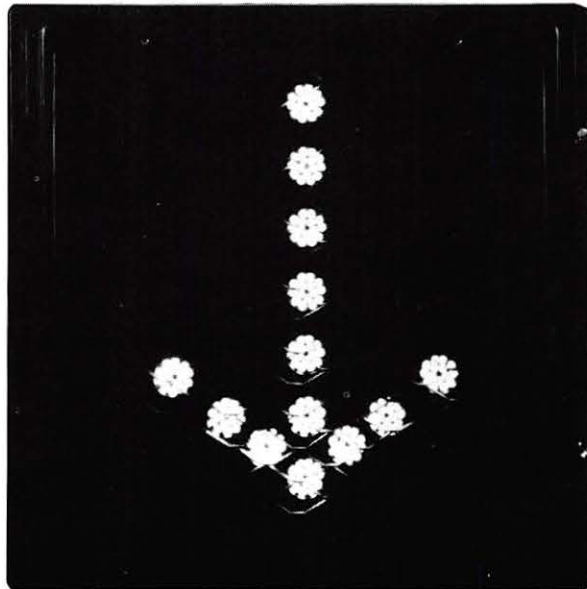


LED 12" Lane Control Signals

(Red X, green arrow, superimposed X and arrow)

Features

- Three complementary lane-control signals
- Ultra-bright one-inch LED clusters
- Highly energy efficient and reliable
- Die-cast 12" aluminum housing
- Spanwire or mastarm mounting



Description

This series of three lane-control signals offers separate red X and green arrow signals for lanes with a fixed traffic direction and a superimposed red X, green arrow signal for reversible traffic lanes. All three signals use ultra-bright one-inch LED clusters for high visibility, low power consumption and the utmost in reliability.

Typical applications are the control of reversible traffic lanes, the opening and closing of entrance and exit lanes, and toll booths. The relatively small size of these 12" signals is ideal for use in tunnels.

Bright LED clusters

The light-emitting elements are 24 mm diameter LED clusters, each consisting of 15 ultra-bright LED lamps. These are remarkably efficient in converting electrical energy into light, thus dramatically reducing energy costs over conventional light emitting technologies, such as incandescent or fiber optics.

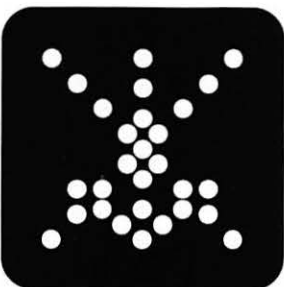
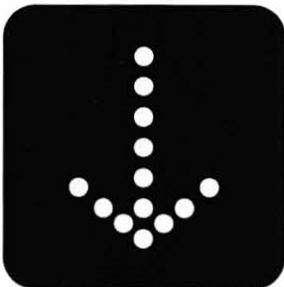
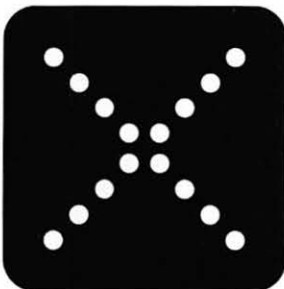
Red and green are natural primary colors of LEDs, and no light energy is lost through filtering. Power consumption is only 8.5 watts for the red X and 9 watts

for the green arrow. Typical power consumption would be 67 watts for an incandescent signal or 43 watts for fiber optics (single bulb). At an average power of 8.75 watts for the LED signal and a cost of \$0.12/kWh for electricity, the power savings alone over the 5-year warranty of the LED signal would be \$306 over incandescents and \$180 over fiber optics.

The LEDs are also extremely reliable and do not require scheduled annual maintenance. Their life is nominally specified at 100,000 hours of continuous operation at rated brightness (nearly 12 years). There is no burnout mechanism as for incandescent bulbs. To maximize reliability, wiring is such that the loss of any single LED in a cluster will only dim that cluster, not deactivate it.

Cast aluminum housing

These signals use a rugged, die-cast aluminum housing, which is electrostatically painted with a single coat of durable and environmentally safe polyester powder coating. The door and visor are painted black. All mounting hardware is stainless steel. Visor and sunscreen options are available.



Specifications

LED 12" lane control signals

1. Introduction

This series of lane-control signals shall offer separate red X, green arrow and superimposed red X, green arrow signals. All three signals shall use ultra-bright one-inch LED clusters for high visibility, low power consumption and high reliability.

The external signal dimensions shall be 14" vertical by 14" horizontal by 8 1/4" deep. The red X shall measure 10" by 10". The green arrow shall measure 10" vertical by 7 1/4" horizontal.

2. Optical

The light emitting elements shall be LED clusters, which shall be visible in sunlight. Each LED cluster shall be 24 mm in diameter and shall contain 15 ultra-bright LEDs. The LED clusters in the X shall be red, with a rated light output of 1500 mcd or more. The LED clusters in the arrow shall be green, with a rated light output of 1500 mcd or more. Each cluster shall be protected against sunlight by a full-circle visor with a nominal depth of 3/4" as measured from the base of the LEDs.

The LEDs shall be rated for 100,000 hours of continuous operation at rated brightness. The LEDs shall project light in a direction normal to the plane of the sign. The half brightness point relative to on-axis brightness shall be within $\pm 10^\circ$.

3. Electrical

The red X and green arrow shall each have a 120 VAC power connection via clearly labeled screw terminals. Power consumption for each signal shall not exceed 9 watts at 120 VAC line voltage.

The only tools necessary for changing LED clusters shall be a screwdriver and a 14 mm open-end wrench. Suitably-long lead wires shall be an integral part of each LED cluster.

The LED lamps in each cluster shall be so wired that the loss of any single LED will not deactivate a cluster.

4. Housing

The housing shall be a one-piece, corrosion-resistant, 360 aluminum alloy die casting. Two integrally-cast hinge lugs and two integrally cast latch screw slots shall be on each

side. The top and bottom of the housing shall have a 2" opening to accommodate standard 1 1/2" pipe brackets. Each opening shall have a Shurlock boss integrally cast into the housing. The radial angular grooves of this boss, when used with Shurlock fittings, shall allow positive 5° increment alignment of the signal head. No externally protruding screws shall mar the mechanical integrity of the housing.

5. Housing door

The door shall be a one-piece, corrosion-resistant, 360 aluminum alloy die casting. Two hinge lugs shall be cast on one side, and two latch points shall be cast on the other side. The door shall be attached to the housing by means of stainless steel L-shaped hinge pins and L-shaped latch screws with wing nuts. This hardware shall allow easy opening/closing and attachment/removal of the door without the use of tools.

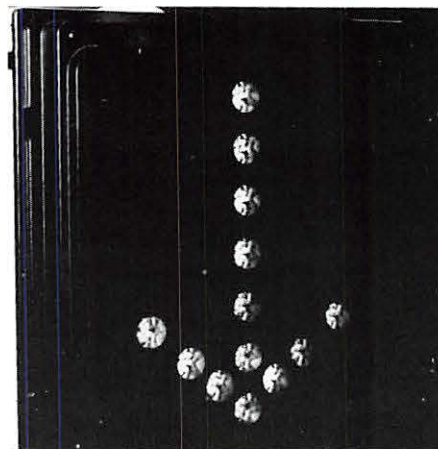
A resilient and mildewproof EPDM gasket shall be mounted in a groove inside the door and shall be compressed by a raised bead on the housing when the door is closed to provide a positive environmental seal against external dirt and moisture.

A clear lens in the door shall provide environmental protection for the LED clusters. This lens shall measure 12" by 12". It shall be made of shatterproof polycarbonate plastic and shall be mounted in a molded, gap-less silicone gasket.

6. Painting

All exposed metal parts of the housing, door and visor (excluding stainless steel parts) shall be pre-treated for painting in the following stages: degrease, hot rinse, etch with an iron phosphate solution, hot rinse, chemical seal, and dry for at least 10 minutes at 300°F to 400°F. The parts shall then be painted with a single coat of environmentally safe, ultraviolet resistant, polyester powder coating, which shall be applied electrostatically at 90 kV and baked for 20 minutes at 375°F per ASTM D-3359, ASTM D-3363 and ASTM D-522. The following colors shall be standard:

Green - Federal Standard 595a-14056.
Yellow - Federal Standard 595a-13538.
Black - Federal Standard 595a-37038.



Each LED cluster is complete with its own full circle visor for high contrast in sunlight

Technical data

Dimensions ..	14" W x 14" H x 8 1/4" D
Weight, typ.....	12 lbs
Operating temperature:....	-35 to +75°C
Voltage, nominal.....	120 VAC
Voltage, range.....	95 to 135 VAC
Power consumption at 120 VAC:	
Red X.....	8.5 W
Green arrow.....	9 W

Ordering Guide

Example: LCS12X-Y-4

Position 1: displayed symbols

LCS12X = Red X only
LCS12R = Green arrow only
LCS12S = Superimposed X and arrow

Position 2: housing color

G = Green
Y = Yellow
B = Gloss black
F = Flat black
U = Unpainted
X = Special color

Position 3: options

1 = No visor or sunscreen
2 = With sunscreen
3 = With visor
4 = With sunscreen and visor



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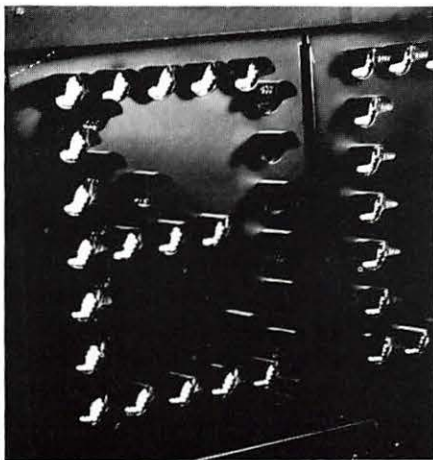


OPEN/CLOSED LED Sign

(For truck weigh/inspection stations)

Features

- Superimposed OPEN & CLOSED messages
- 14.75" high characters legible up to 700'
- Energy-efficient, ultra-bright 1.5" LED pixels
- Choice of red/green or amber messages
- Sealed, aluminum sign housing
- Controller in separate NEMA-3R cabinet
- Current sensing and radio control options
- Five-year warranty



Each LED pixel is complete with its own cap visor for high contrast in sunlight. Each letter is on its own sign panel.



Description

This truck weigh/inspection station sign uses 1.50" diameter LED pixels for high visual punch, low power consumption, and solid state reliability. There are no moving parts to wear out or filaments to break, as for incandescent or fiberoptic lamps. No annual relamping is required.

Legible in any light

The character height is 14.75" for legibility up to 700 feet, based on the rule of thumb that maximum reading distance in feet will be 50 times the character height in inches.

The pixels are optimized for installation in VMS/CMS traffic signs and are readily visible in bright sunlight. Each consists of 30 ultra-bright LED lamps and is complete with its own 1.9" long cap visor. A brilliant amber color is achieved by mixing 24 green and 6 red LED lamps. Dimming is selectable for use at night.

The sign is available in three color combinations. The OPEN message may be green or amber; the CLOSED message may be red or amber. Maximum power for the sign is only 95 W if the CLOSED message is red, 110 W if it is amber.

Rugged housing

The housing is of aluminum construction, including a sturdy U-channel frame. The corrosion-resistant aluminum parts are further electrostatically powder coated and baked. Weatherproofing is achieved with a UV-stabilized polycarbonate window over the pixels and RTV sealing or gasketing for all exposed seams of the housing. External sign dimensions are 24" x 96" x 4" (H x W x D).

A mounting kit is available. It includes 4 x 3 L-channel extrusions for the top and bottom of the sign frame plus hardware for clamping to I-beams or mounting posts at the right and left of the sign.

Separate controller

The sign is driven by a controller in a separate NEMA-3R cabinet. The OPEN message and dimming are each selected by applying a 120 VAC signal to a control terminal. Remote control via pulse-coded FM radio is optional, as is current sensing with a contact-closure output for each of the two messages.

Specification

LED OPEN/CLOSED Sign

1. Introduction

The sign system shall consist of the OPEN/CLOSED sign proper, a sign mounting kit and a sign controller in a separate cabinet. The captions OPEN or CLOSED as well as dimming shall be remotely selectable. The character height shall be 14.75" for legibility up to 700 feet. The sign shall be available in three versions for different color combinations of the OPEN and CLOSED messages: green and red, amber and red, amber and amber.

2. Light-emitting pixels

The light-emitting elements shall be 1.50" diameter LED pixels, each consisting of 30 ultra-bright LED lamps. The rated on-axis brightness shall be 18 cd for the red pixels, 12 cd for the green pixels and 13 cd for the amber pixels. The amber color shall be achieved by combining 6 red and 24 green LED lamps.

The pixel housing shall be injection-molded of UV-stabilized polycarbonate and shall be complete with a removable 1.9" long cap visor as measured from the sign panel. The base of the LEDs shall be potted so as to form a hermetic seal with the pixel housing. Machining of the sign panel for each pixel shall be limited to a 0.394" (10 mm) diameter hole centered on the axis of the pixel plus a 0.125" hole for an alignment pin. The center-to-center spacing between the two holes shall be 0.50". Each pixel shall be held in place by a Tinnerman nut sized for an 11/16" open-end wrench.

3. Sign housing

Overall dimensions of the sign housing shall be 24"x 96"x 4" (H x W x D). The sign frame shall be of one-piece welded construction and shall be made of 6063-T4 sharp-corner U-shape aluminum extrusion channel with a 3" wide base, 2" deep sides and 0.125" thick walls. The back panel shall consist of 0.090" thick aluminum sheet metal and shall be riveted in place and sealed with DOW 732 RTV or approved equal.

The message panel shall provide a black background. It shall consist of six character modules for ease of service.

The sign face shall be protected by a weather-tight sheet of UV-stabilized polycarbonate not less than 6.0 mm thick. This sheet shall be mounted in an aluminum frame, which shall be gasketed to provide a weathertight seal when closed. A piano hinge at the top of the window frame shall be available as an option for easy access to the front of the pixels.

The housing shall be painted as specified. All paint used in the sign and controller cabinet shall be an environmentally safe, UV-stabilized polyester powder coating, which shall be applied electrostatically and baked at elevated temperature per ASTM D-3359, ASTM D-3363 and ASTM D-522

4. Sign mounting kit

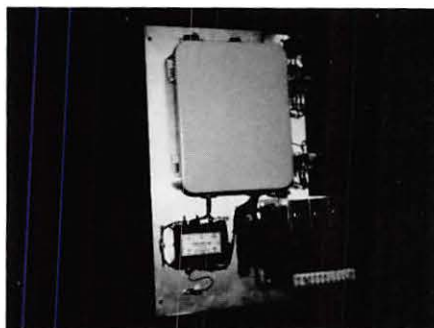
A kit shall be available for mounting the sign to two vertical I-beams or posts. The kit shall include 4 x 3 L-channel aluminum extrusions for the top and bottom of the sign, four 2 x 3 U-channel aluminum braces, and stainless steel mounting hardware (bolts, lockwashers, locknuts). The mounting kit shall provide adjustability to allow the clearance between the I-beams or posts to vary from 8' to 10'.

5. Sign controller

The controller shall be installed in a separate NEMA-3R aluminum enclosure measuring approximately 22" x 15" x 7" (H x W x D). The cabinet shall include a Corbin No. 2 standard traffic signal lock and key. Terminal blocks in the cabinet shall accept conductor sizes up to 12 AWG.

The sign controller shall contain the following circuit elements: AC circuit breaker, AC surge suppression circuit, DC power supply, dimming circuit, and relays to select the message caption and dimming. The OPEN message as well as dimming shall be selectable by applying 120 VAC power to control terminals. Options shall include message current sensing with contact closure outputs, remote sign actuation via one-way FM radio, and remote sign actuation and current sensing via two-way radio.

A complete specification on paper or PC-compatible floppy disk is available to prospective customers.



Controller electronics with optional remote-control radio (gray box)

Technical summary

Dimensions	24"x 96"x 4" (H x W x D)
Weight, approx.	80 lbs
Character height	14.75"
Max legibility	700 feet
Ambient temperature	-35 to +60°C
Voltage, nominal	120 VAC
Voltage, range	95 to 135 VAC
Max power at 120 VAC	110 W

Ordering Guide

Example: OC2496-GR-Y, H, R1, M

Position 1: sign type

OC2496 = O/C 24"x96"x3" sign

Position 2: message color

GR = Green OPEN, red CLOSED

AR = Amber OPEN, red CLOSED

AA = Amber OPEN, amber CLOSED

Position 3: housing color

G = Green

Y = Yellow

B = Gloss black

F = Flat black

U = Unpainted

X = Special color

Add-on options:

H = Hinge at top of window frame

C = Current sensing option

R1 = One-way radio to actuate controller

R2 = Two-way radio to actuate controller & report contact closures

M = Mounting kit for two posts



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PN/LED-6

RED SIGNAL AHEAD LED warning sign

Features

- 48"x 48" or 60"x 60" diamond shape
- Diamond-grade reflective material
- Ultra-bright red LED pixels
- Two flashing modes to draw attention
- Rugged 3/16" aluminum panels

Description

This regulatory sign is a warning device for blind intersections where a motorist cannot see a red signal ahead in time to stop safely. It commands a high degree of attention by combining the standard MUTCD diamond shape with large size (48"x 48" or 60"x 60"), yellow 3M Diamond Grade reflective material, and ultra-bright red LEDs.

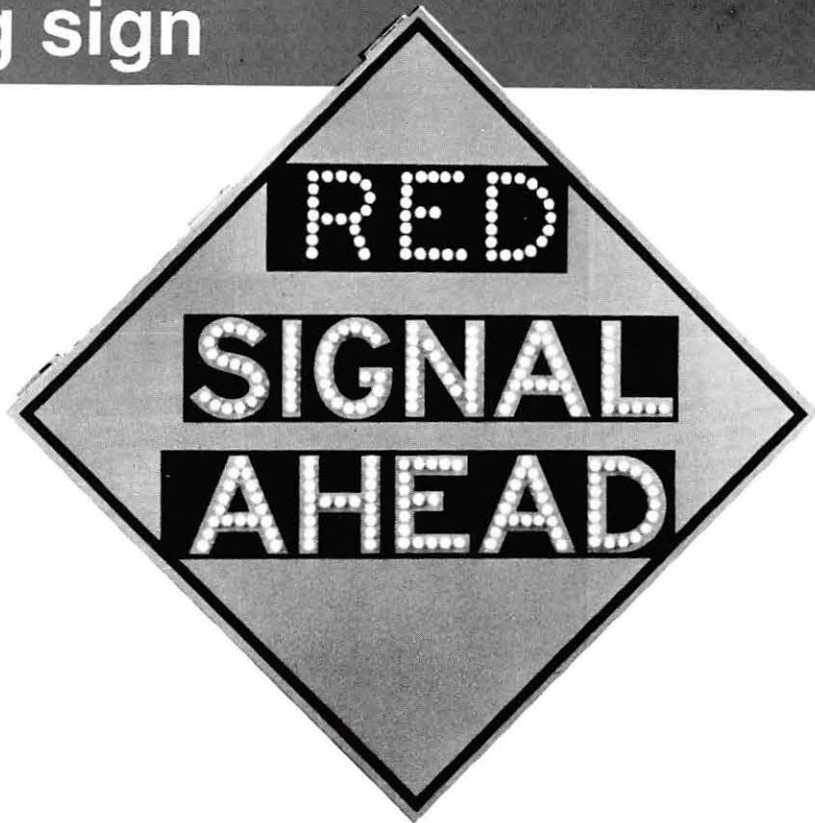
A pole-mounted controller allows the message SIGNAL AHEAD to be on continuously or to flash, or to flash in wig-wag fashion with the word RED.

A two-circuit solid-state flasher is part of the sign controller. Three different operating states are selected by 120 VAC signal lines from the intersection controller.

Ultra-bright LEDs

The light-emitting elements are 24 mm diameter LED clusters, each consisting of 15 ultra-bright red LED lamps. These are remarkably efficient in converting electrical energy into light, thus dramatically reducing energy costs over conventional light emitting technologies, such as incandescent lamps or fiber optics.

The LEDs are also extremely reliable and do not require scheduled annual maintenance. Their life is nominally specified at 100,000 hours of continuous operation at rated brightness (nearly 12 years). There is no burnout mechanism as for incandescent bulbs. To maximize reliability, the wiring of this sign is such that the loss of any single LED in a cluster will only dim that cluster, not deactivate it.



Built to last

This sign is designed for ease of installation, ease of service and long life in the field. The front and rear panels are made of 3/16" thick aluminum. Opening the message panel does not require the use of tools and is assisted by gas struts. For maximum accessibility, all electrical components other than the LEDs are housed in a separate pole-mounted sign controller cabinet. The LED clusters are field-replaceable.



Each LED cluster is complete with its own cap visor to assure high contrast in sunlight.

Ordering Guide

Example: 33089-G1-Y

Position 1: dimensions

33089G1 = 60"x 60"
33089G2 = 48"x 48"

Position 2: color of back & sides

G = Green
Y = Yellow
B = Gloss black
F = Flat black
U = Unpainted
X = Special color

Specifications

"RED SIGNAL AHEAD" LED warning sign

1. Functional requirements

This regulatory sign shall be designed as a warning device for blind intersections where obstructions prevent a motorist from seeing a signal ahead in time to stop safely.

Ultra-bright LEDs shall be used as light-emitting elements in view of their high visual punch, high reliability and low power consumption.

2. Physical structure

The sign shall be diamond-shaped and shall be available with nominal side dimensions of 48"x 48" or 60"x 60". The message panel and rear panel shall be made of 3/16" thick aluminum. The four sides shall be aluminum extrusions. The nominal thickness of the sign shall be 5 1/4".

Hardware shall be provided to allow pole or mast arm mounting. This hardware shall consist of two Pelco Astro-Brac sign mounting brackets, Model AB-0134-L-L, or approved equal.

The message panel shall be attached to the housing by means of a stainless steel hinge and stainless steel fasteners. To facilitate replacement of LED clusters, the sign shall open from bottom right to top left, and the support system of the message panel shall include dual gas struts. The stainless steel fasteners shall not require the use of any tools. They shall be over-center draw latches, Southco Series 50, or approved equal.

The only electronic components in the sign shall be the LED clusters and terminal blocks. The power transformer, flasher unit and full-wave rectifiers shall be in a separate pole-mounted sign controller cabinet. This cabinet shall measure 14" H x 10" W x 8" D.

The sign and sign controller shall be weather-protected to NEMA 3 specifications and shall be rated for the NEMA operating temperature range of -35°C to +75°C. The outside surfaces of the rear panel and the sides shall either be unpainted aluminum or be painted, as specified.

3. Message panel

The standard background of the message panel shall be yellow 3M Diamond Grade reflective material. The border line shall be black. A black rectangle shall surround the words RED, SIGNAL and AHEAD, as illustrated. The words SIGNAL and AHEAD shall be formed out of the yellow reflective material, so that they are visible when no power is applied. The LED clusters for the word RED shall be mounted directly on the black background so that the word RED is effectively blanked out in the absence of applied power.

Applying 120 VAC power to the sign shall put the message SIGNAL AHEAD in a continuous ON state. This state will normally indicate that the signal ahead is green.

Applying 120 VAC power to a first control line shall flash the message SIGNAL AHEAD. This state will normally indicate that the signal ahead is yellow or is about to turn yellow.

Applying 120 VAC power to a second control line shall alternately flash the messages RED and SIGNAL AHEAD in wig-wag fashion. This state will normally indicate that the signal ahead is red or is about to turn red.

Applying power to third control line shall dim the sign for use at night.

The light-emitting elements used to highlight the messages shall be 24 mm diameter LED clusters (or pixels), each containing 15 ultra-bright red LEDs. The rated light output per LED cluster shall be at least 1,500 mcd. Each cluster shall be protected against sunlight by a cap visor with a nominal depth of 3/4" as measured from the base of the LEDs. The LEDs shall be rated for 100,000 hours of continuous operation at rated brightness.

For the sign version with side dimensions of 48"x 48", the nominal character height shall be 9 5/8". The message SIGNAL AHEAD shall use 137 LED clusters, and the word RED shall use 41 LED clusters.

For the sign version with side dimensions of 60"x 60", the nominal character height shall be 10". The message SIGNAL AHEAD shall use 167 LED clusters, and the word RED shall use 54 LED clusters.

4. Electrical

The sign shall be powered by nominal 120 VAC, 50/60 Hz power, with a voltage range of 95 to 135 VAC.

All electrical connections in the sign and in the sign controller cabinet shall be via clearly labeled screw terminals. The only tool necessary for making electrical connections shall be a screwdriver. The only tools necessary for changing LED clusters shall be a screwdriver and a 14 mm open-end wrench. Suitably-long lead wires shall be part of each LED cluster.

There shall only be four electrical lines between the sign and the sign controller. These shall be DC+ and DC- for the message SIGNAL AHEAD and DC+ and DC- for the word RED.

The electrical lines between the intersection controller and the sign controller shall be main 120 VAC power and 120 VAC control lines for SIGNAL AHEAD single flash, RED and SIGNAL AHEAD wig-wag flash, and dimming for sign use at night. A two-circuit solid-state flasher shall be part of the sign controller.

Dimming of the sign for night-time operation shall be initiated by a 120 VAC dimming signal from the intersection controller. Eleven different dimming levels shall be selectable via transformer taps.

For the sign version with nominal side dimensions of 48"x 48", power consumption with all LEDs ON shall be approximately 150 W for the message SIGNAL AHEAD and 28 W for the word RED.

For the sign version with nominal side dimensions of 60"x 60", power consumption shall be approximately 160 W for the message SIGNAL AHEAD and 29 W for the word RED.

In the interest of reliability, the individual LED lamps in the LED clusters shall be so wired that the loss of any single LED in a cluster will only dim that cluster, not deactivate it.

5. Warranty

The sign shall be warranted by its manufacturer for a period of five years. The warranty shall include the light-emitting elements.

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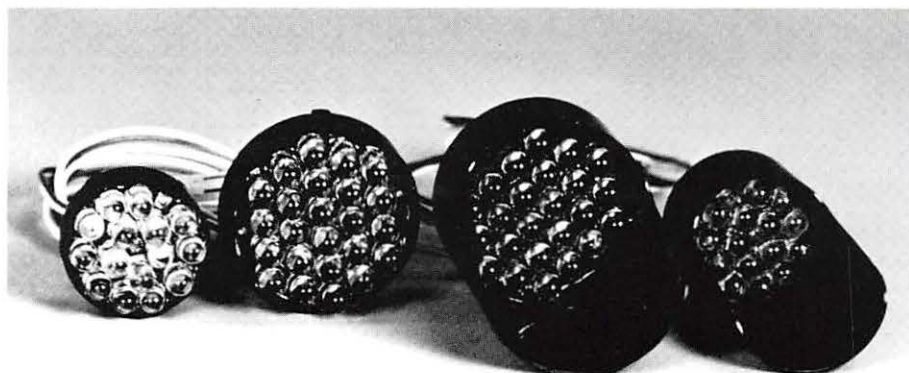
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1.1", 1.5" & 2.3" LED Pixels

Features

- Optimized for VMS/CMS traffic signs
- Hermetically sealed & gasketed
- Directly mountable in sign panel
- Easily wired via built-in wire leads
- High visual punch
- Low power consumption
- Solid state reliability
- Choice of three sizes
- Choice of four colors
- Designed & built by Econolite



Description

Econolite's LED pixels are optimized for outdoor installation in VMS/CMS traffic signs. They provide exceptional brightness and visual punch, as made possible by ultra-bright red, green and yellow LED lamps. A brilliant amber is achieved by mixing red and green LEDs in the appropriate ratio. No light is lost through filtering or masking. A removable cap visor is standard to assure high contrast in sunlight.

Available in three sizes

The pixels are available with outside diameters of 1.1", 1.5" and 2.3". These sizes are ideal for 5 x 7 dot matrix characters with a nominal height of 9", 12"-15" and 18", respectively. The corresponding maximum sign reading distances will be 450', 600'-750' and 900', based on the rule of thumb is that maximum reading distance in feet will be 50 times character height in inches.

The 2.30" pixels are exceptional. They provide 64 LED lamps, which is 28% more than the 50 LEDs normally found in pixels with a nominal 2" or 50 mm diameter. On-axis brightness for the red LED version is a remarkable 38 cd. The 2.30"

pixels also provide two independent LED circuits with a three-wire connection, so that color control is possible.

All three pixel sizes feature high visual punch, low energy consumption and solid state reliability. There is no burnout mechanism as for incandescent or fiber-optic lamps, and annual relamping is not required.

Easy to install & wire

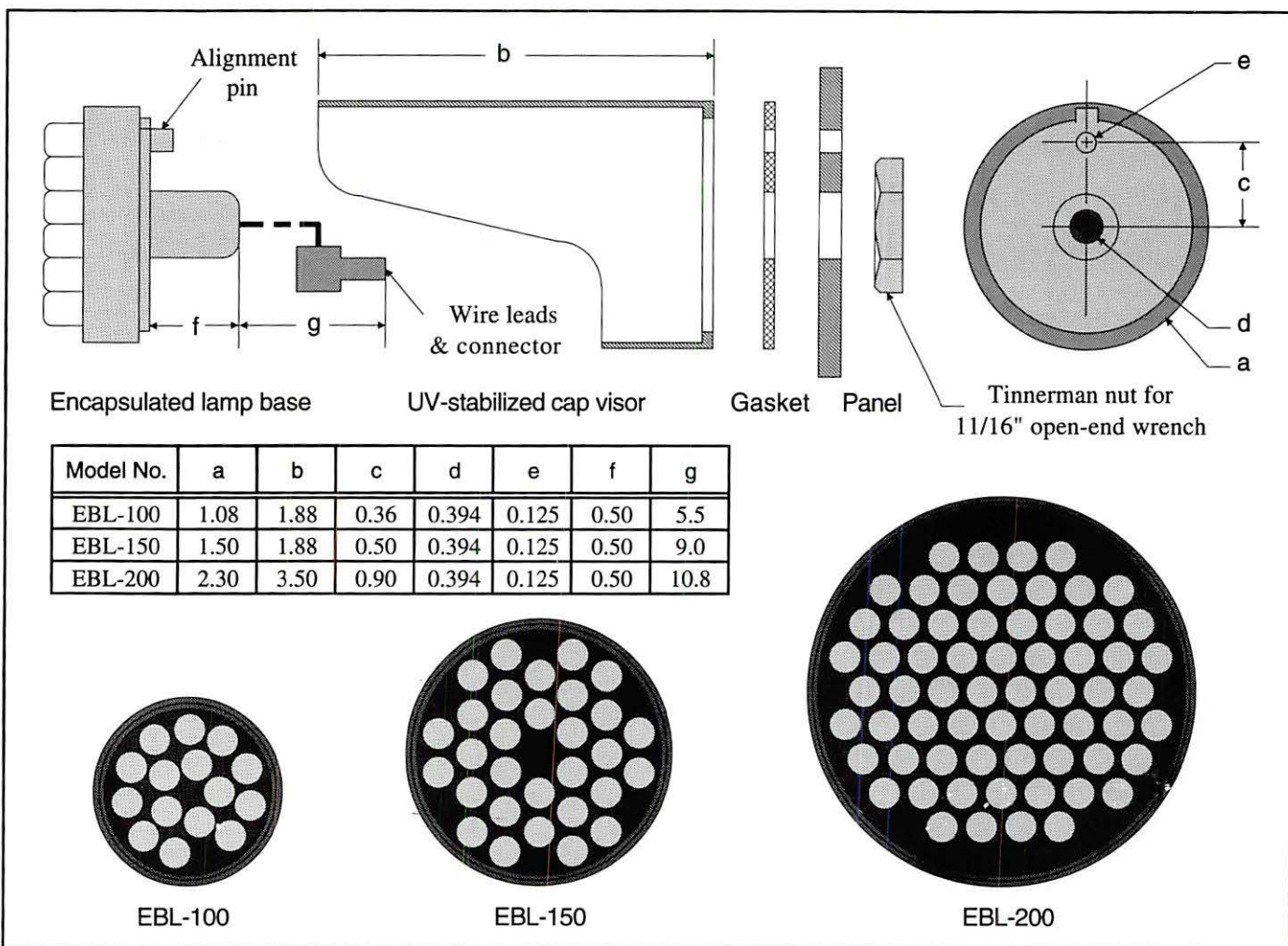
The pixels are fully encapsulated. They are designed for outdoor mounting in a sign panel, with no need for an additional lens cover or window. Mechanical installation simply requires a 0.394" (10 mm) diameter hole for the pixel base and a 1/8" hole for an alignment pin. The pixel base as well as a removable cap visor and a weatherproofing gasket are held in place by a Tinnerman nut, which is tightened with an 11/16" open-end wrench. A metal sign panel will also act as a heat sink for the LEDs.

Electrical connection is via wire leads. The pixels are available with either 4-foot unterminated leads or shorter leads terminated by a Panduit HCE100F24 100 mil female connector.



In addition to maximizing visual punch, the use of discrete pixels facilitates the manufacture of custom signs. The pixels fit directly in holes punched into a panel. Wire leads facilitate wiring, with no need for custom circuit boards.

Outside diameter	Model number	LEDs per pixel	LED color	Peak wavelength	Luminous intensity	Vf typical	If typical	If max	Operating temp
1.08" (27.4 mm)	EBL-100-R	15 ea	red	660 nm	9.0 cd	26.2 V	20 mA	30 mA	-40 C to +60 C
	EBL-100-G	15 ea	green	563 nm	6.0 cd	31.5 V	20 mA	30 mA	
	EBL-100-Y	15 ea	yellow	585 nm	2.2 cd	30.7 V	20 mA	30 mA	
	EBL-100-A	3 ea	red	660 nm	6.6 cd	30.5 V	20 mA	30 mA	
		12 ea	green	563 nm					
1.50" (38.1 mm)	EBL-150-R	30 ea	red	660 nm	18 cd	10.5 V	100 mA	150 mA	
	EBL-150-G	30 ea	green	563 nm	12 cd	12.6 V	100 mA	150 mA	
	EBL-150-Y	30 ea	yellow	585 nm	4.4 cd	12.3 V	100 mA	150 mA	
	EBL-150-A	6 ea	red	660 nm	13 cd	12.2 V	100 mA	150 mA	
		24 ea	green	563 nm					
2.30" (58.4 mm)	EBL-200-R	9 ea	red	660 nm	38 cd	15.7 V	20 mA	30 mA	
		55 ea	red	660 nm		19.2 V	100 mA	150 mA	
	EBL-200-G	9 ea	green	563 nm	26 cd	18.9 V	20 mA	30 mA	
		55 ea	green	563 nm		23.1 V	100 mA	150 mA	
	EBL-200-Y	9 ea	yellow	585 nm	10 cd	18.4 V	20 mA	30 mA	
		55 ea	yellow	585 nm		22.5 V	100 mA	150 mA	
	EBL-200-A	9 ea	red	660 nm	31 cd	15.7 V	20 mA	30 mA	
		55 ea	green	563 nm		23.1 V	100 mA	150 mA	



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LED BLANK-OUT SIGN

Ordering Instructions

Model Number Example: $\frac{\text{LS24L}}{1} \frac{\text{Y}}{2} \frac{2}{3}$

<u>Symbol/ Number</u>	<u>Description</u>	<u>Options</u>
1	LED sign	LS24L
2	Housing color (door is flat black)	G = Green Y = Yellow F = Flat black B = Gloss black U = Gray primer X = Special
3	Configuration	1 = NO LEFT TURN, red LEDs, 30" high cabinet 2 = NO RIGHT TURN, red LEDs, 30" high cabinet

All 24" X 30" cabinets contain three message (word) modules

LED-2

LED U.S. 12" PEDESTRIAN SIGNAL

Ordering Instructions

Model Number Example: $\frac{\text{PED12L}}{1} \frac{\text{Y}}{2}$

<u>Symbol/ Number</u>	<u>Description</u>	<u>Options</u>
1	12" Pedestrian Signal, LED	PED12L
2	Aluminum housing and visor color	G = Green Y = Yellow B = Gloss black F = Flat black C = Yellow housing, flat black door and visor V = Green housing, flat black door and visor X = Special

LED LANE CONTROL SIGNAL

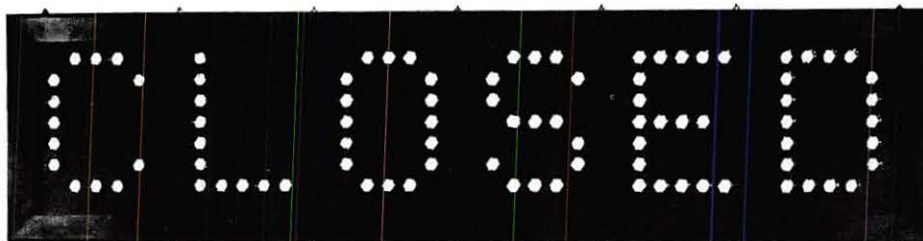
Ordering Instructions

Model Number Example: $\frac{\text{LCS}}{1} \frac{16\text{L}}{2} \frac{\text{Y}}{3} \frac{1}{4} \frac{2}{5}$

<u>Symbol/ Number</u>	<u>Description</u>	<u>Options</u>
1	Lane control Signal, LED, with visor	LCS
2	12" housing 16" housing	12L 16L
3	Housing and visor color	G = Green Y = Yellow B = Gloss black F = Flat black C = Yellow housing, flat black door and visor V = Green housing, flat black door and visor A = Gray X = Special
4	Configuration	1 = Red X, green arrow
5	Visor & sunscreen options	0 = No visor or sunscreen 1 = With visor only 2 = With diamond sunscreen only 3 = Louvered visor 4 = With visor & diamond sunscreen

LED-4

LED SIGNS & SIGNALS



Description	Part Number
OPEN-CLOSED weigh station sign (changeable message from open to closed) (no mounting hardware)	33143G1
RED SIGNAL AHEAD sign, 48" x 48"	33089G2*
RED SIGNAL AHEAD sign, 60" x 60"	33089G1*
12" Red LED signal section, aluminum housing	LTA11*
12" Red LED signal section, polycarbonate housing (colors are green, yellow or black)	LTP11*
12" red LED signal retrofit kit	33200G1*

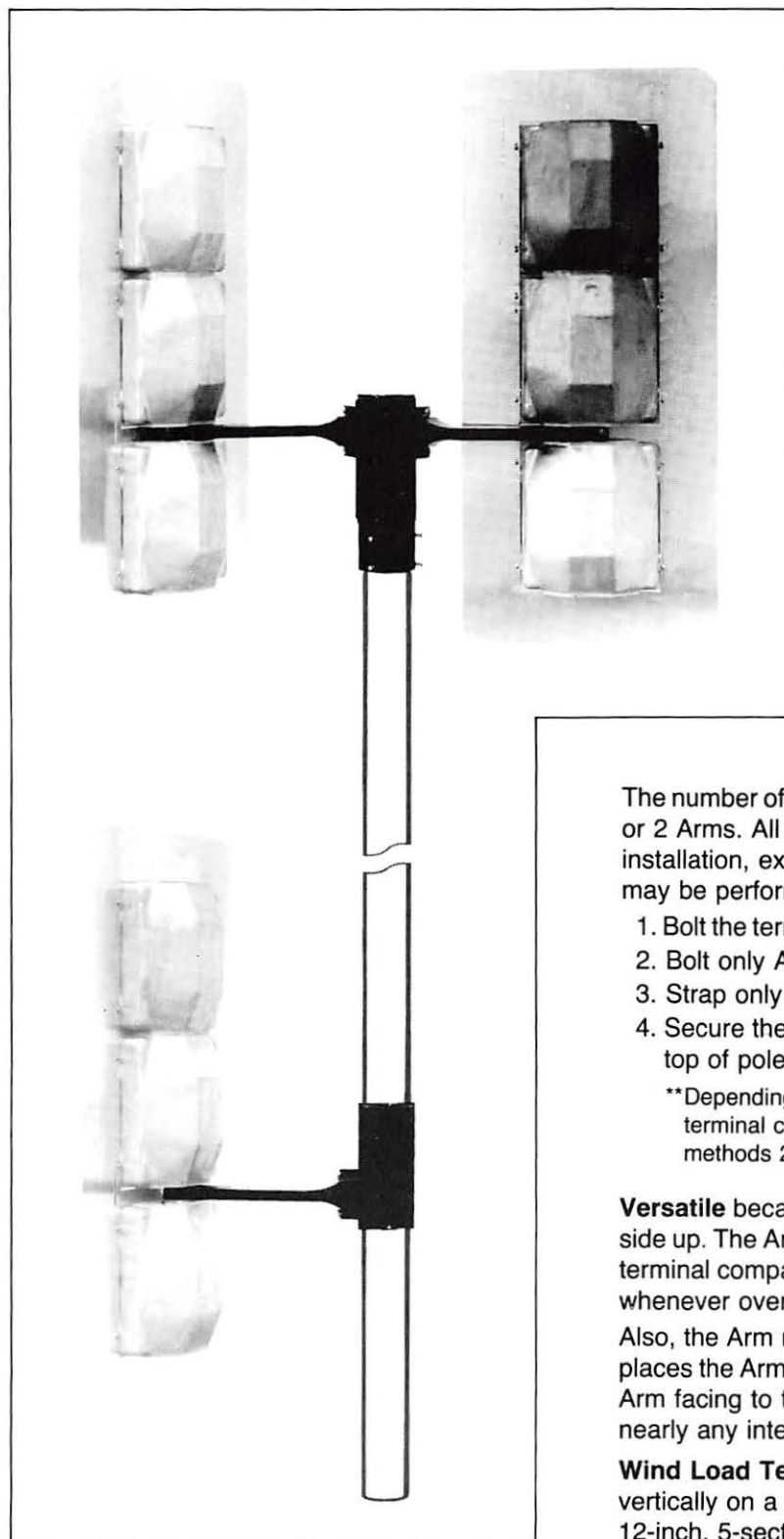
- * G = green
Y = yellow
B = gloss black
F = flat black
U = unpainted
X = special color

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FRAMEWORK & HARDWARE

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MIGHTY-MOUNT SYSTEM



Econolite introduces a signal mounting system that provides a variety of installations using only two basic components: an Arm and a terminal compartment. One Arm is used to mount one signal. Two signals may be mounted to a terminal compartment by using two Arms. Also, the Mighty-Mount system has been designed to attach to virtually any pole. Simple variations in component assembly will provide nearly any signal configuration.

FEATURES

- Quick & Easy Installation
- Versatile
- Wind Load Tested To Over 80 mph
- Attractive Appearance
- Light Weight
- Stockable
- Corrosion Resistant

Quick & Easy Installation because Mighty-Mount has no more than three basic pieces and may be configured 4 ways.

The number of pieces depends on whether the user installs 1 or 2 Arms. All assembly may be completed prior to installation, except signal wiring and alignment. Installation may be performed by the following ways:

1. Bolt the terminal compartment to pole (using 1 or 2 Arms)
2. Bolt only Arm to pole**
3. Strap only Arm to pole**
4. Secure the post top configuration (using 1 or 2 Arms) to top of pole.

**Depending on the intersection wiring requirements, the terminal compartment may be eliminated for installation methods 2 and 3.

Versatile because Mighty-Mount may be installed either side up. The Arm mounting holes are offset to one end of the terminal compartment. This offset provides signal clearance whenever over/under configurations are used.

Also, the Arm may be mounted either side up. One position places the Arm facing to the front while inverting it places the Arm facing to the back. These variations accommodate nearly any intersection configuration requirement.

Wind Load Tested To Over 80 mph horizontally and vertically on a single point attachment while supporting a 12-inch, 5-section traffic signal head with backplate.

MIGHTY-MOUNT SYSTEM

Attractive Appearance through less visible framework in the intersection.

Light Weight through material usage, design, and construction. Mighty-Mount system is available in aluminum, while only the terminal compartment is available in bronze. A typical framework requirement for two, 3-section signals weighs 30 lbs.; whereas, the equivalent Mighty-Mount weighs only 14.5 lbs.

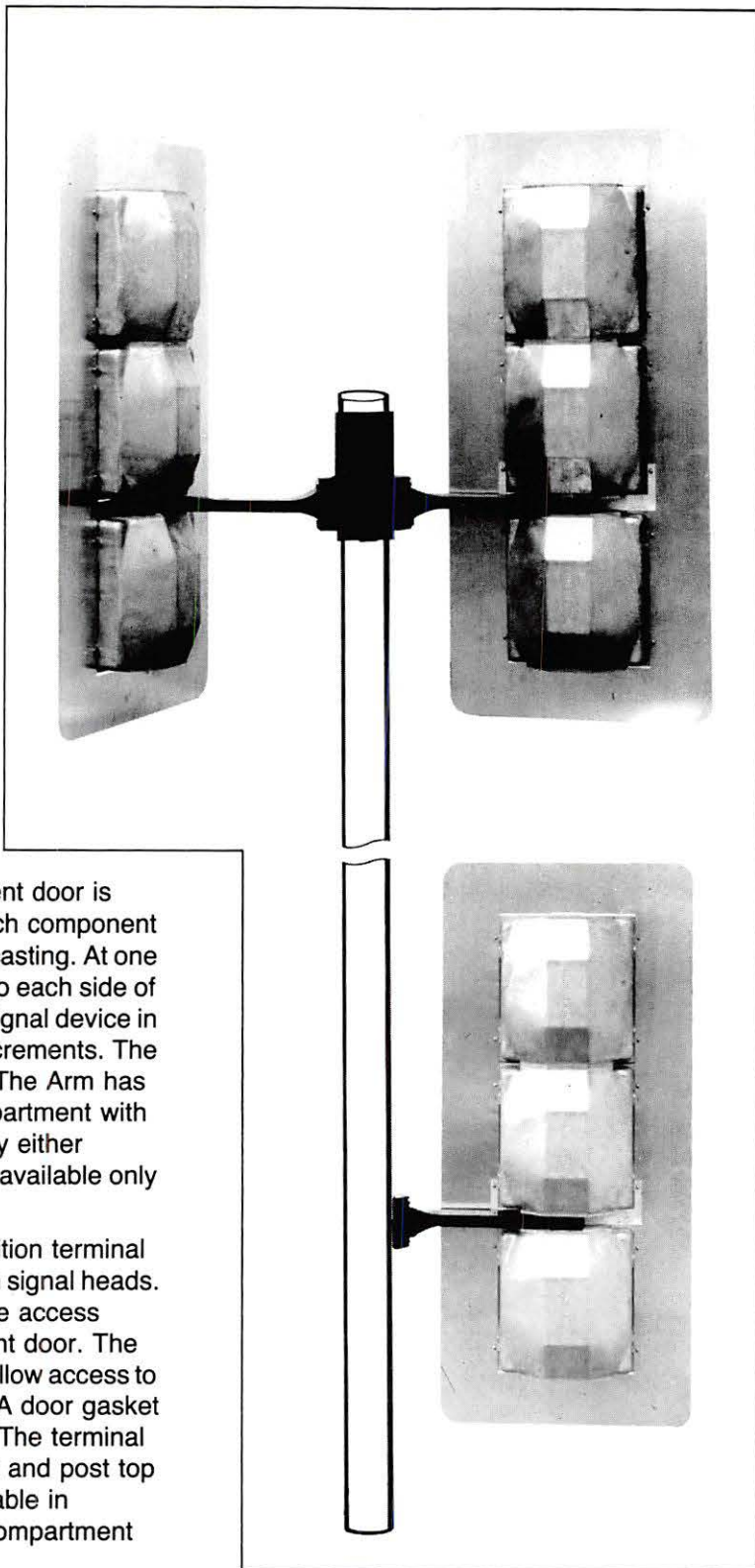
Stockable because the system does not require custom fit. Consequently, an inventory may be maintained in lieu of special framework orders.

Corrosion Resistant because aluminum framework is less prone to corrosion than steel framework. A baked-on painted finish also inhibits corrosion and provides environmental protection.

PHYSICAL DESCRIPTION.

Mighty-Mount consists of an Arm and a terminal compartment. A terminal compartment door is provided with the terminal compartment. Each component is a one-piece, corrosion resistant, aluminum casting. At one end, the Arm contains a shurlock boss cast into each side of the Arm. The angular grooves firmly hold the signal device in place and provide adjustments in 5 degree increments. The opposite end contains the mounting portion. The Arm has been designed to attach to the terminal compartment with corrosion resistant bolts or attach to a pole by either corrosion resistant bolts or straps. The Arm is available only in aluminum.

The terminal compartment contains a 12-position terminal strip to accommodate wiring for up to 5-section signal heads. The front of the compartment provides a large access opening, covered by the terminal compartment door. The door has been designed to pivot at one end to allow access to the terminal strip without removing the door. A door gasket provides a water and weather resistant seal. The terminal compartment configurations include side pole and post top mounting. The terminal compartment is available in aluminum or bronze; whereas, the terminal compartment door is available only in aluminum.



FRAMEWORK

Mighty-Mount System Configuration Ordering Instructions

Model Number Example: FWV $\frac{15}{1}$ $\frac{32}{2}$ $\frac{A}{3}$ $\frac{Y}{*}$

<u>Symbol/ Number</u>	<u>Description</u>	<u>Options</u>
1	Arm location and terminal compartment material or if Arm only	See page F-4 for configurations 10 = Wired with attaching hardware
2	Signal face arrangement or Ped head	See page V-0 for face arrangements 70 = Wired with attaching hardware
3	Terminal compartment material	A = Aluminum B = Bronze
*	Framework color	G = Green F = Flat black Y = Yellow X = Specify color B = Gloss black

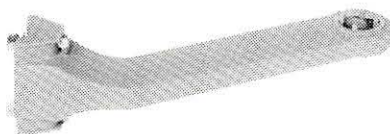


Figure 1



Figure 2

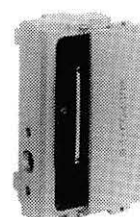


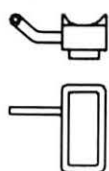
Figure 3

Figure	Description	Aluminum	Bronze
1	Arm without hardware or wiring	E2141A*	----
2	Terminal compartment without arm for post top (includes terminal block, door, with side cover packaged inside)	FWV3000A*	FWV3000B*
3	Terminal compartment without arm for side of pole (includes terminal block, door with side cover packaged inside)	FWV1000A*	FWV1000B*

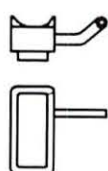
FRAMEWORK Mighty-Mount System

Adapter to Arm Location Symbols

SIDE POLE-ALUM ARM
POST TOP-ALUM ARM



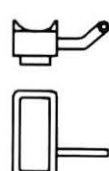
11
51



12
52

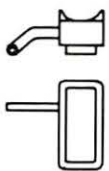


13
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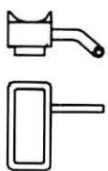


14
-

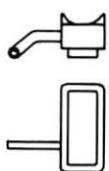
SIDE POLE-ALUM ARM
POST TOP-ALUM ARM



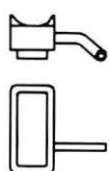
15
55



16
56

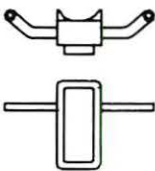


17
-

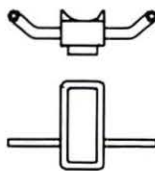


18
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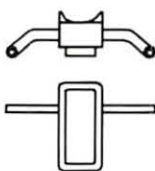
SIDE POLE-ALUM ARM
POST TOP-ALUM ARM



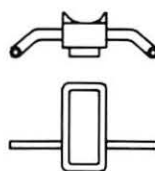
21
61



22
-

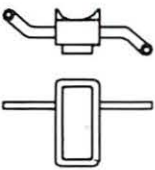


23
63

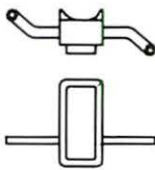


24
-

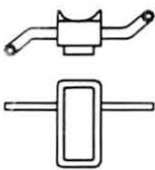
SIDE POLE-ALUM ARM
POST TOP-ALUM ARM



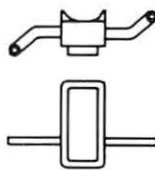
25
65



26
-



27
67



28
-

NOTE: If face arrangement symbol is 70 for ped wiring, then special ped attaching hardware is included.

FRAMEWORK ORDERING INSTRUCTIONS

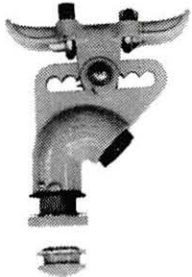
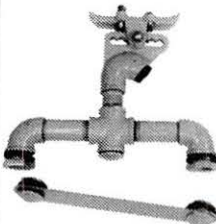
Model Number Example:

FWA	2522	A	Y
1	2	3	4

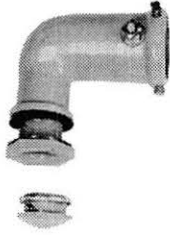
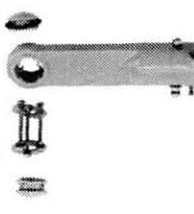
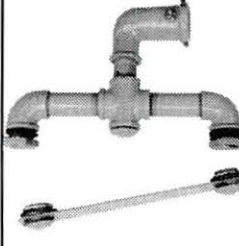
<u>Symbol/ Number</u>	<u>Description</u>	<u>Options</u>
1	Head type	FWA = EA, TA, CA, PED series heads FWP = EP, TP, CP series heads FW = E31, T31, C35 series heads - also 3M PV or ped heads
2	Framework configuration	Four digit number from following framework pages (except numbers that begin with E)
3	Material of adapter	A = Aluminum B = Bronze
4	Signal color	G = Green Y = Yellow B = Gloss black F = Flat black X = Specify color

FRAMEWORK OVERHEAD MOUNTING

Spanwire

					
Description	One Way w/Drop Nipples	One Way w/Lock Nipples	Two-Way	Three-Way	Four-Way
As pictured above	2450	2460	2461	2463	2464
With balance adjustor	2455	2465	2466	2468	2469
With long nipples for backplates			2471	2473	2474

Mastarm

					
Description	1-Way	1-Way	2-Way	3-Way	4-Way
Elevator plumbizer	0904	----	----	----	----
Top mounted plumbizer		0900	2961	2963	2964
Top mounted plumbizer with long nipples for backplates			2971	2973	2974

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FRAMEWORK

Sidepole Mounting

					
Description	6-1/2"	10"	12"	6-1/2", 10"	10", 12"
Pole plates not included	0716	2726	5220	0702	2702
Pole plates E2150P2 and E2151P2 included	0700	2700	5211	0709	----

FRAMEWORK

Pole Plates



Figure 1



Figure 2



Figure 3



Figure 4



Figure 5



Figure 6



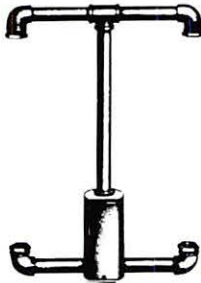
Figure 7

Figure	Description	Model Number
	Pole plate, bronze without cable guide	E2150*
2	Pole plate, bronze with cable guide	E2151*
3	Pole plate, aluminum with 1-1/2" horizontal hub	E2152*
4	Pole plate, aluminum with 1-1/2" horizontal hub and 1-1/4" downward hub	E2153*
5	Pole plate, aluminum, band-on type	E2154*
6	Pole plate, aluminum, band-on type, narrow back	E2155*
7	Pole plate, oval, malleable flatback, 1-1/2" nipple	E2158*

*Color: P3 = Green; P4 = Yellow; P5 = Gloss black; X = Specify color

FRAMEWORK

Side Pole Mounting with Terminal Compartment

				
Description*	LOD	ROD		With Offset
EA3	0114	0102	0101	0164
EA3 + TA3	----	----	4177	4178
EA3 + TA4	----	----	4138	----
EA3 + TA55	----	----	4185	----
EA3 + CA35/CA36	----	----	4113	4101
EA3 + CA46	----	----	4111	4135
EA3 + CA59	----	----	4181	4108
EA3 + 3 sec PV	----	----	7612	7648
TA3	2114	2102	2101	2164
TA3 + EA3	----	----	4124	4128
TA3 + TA5	----	----	2146	----
TA3 + CA59	----	----	4183	----
TA3 + 3 sec PV	----	----	7569	----
TA4	2144	2143	----	----
TA4 + TA3	----	----	2129	----

*First head designation is left of door on multiple head framework.

Three-way and four-way frameworks are available. Consult your local Econolite representative.

FRAMEWORK

Side Pole Mounting with Terminal Compartment

Description*				
	LOD	ROD		With Offset
TA5	2144	2145	----	----
TA5 + TA3	----	----	2130	----
TA5 + TA4	----	----	----	2132
TA55 + EA3	----	----	4184	----
CA35, 36	4105	4106	4158	4100
CA35/CA36 + EA3	----	----	4165	----
CA35,36 + 3 sec PV	----	----	7632	----
CA46	4109	4148	----	----
CA46 + EA3	----	----	4110	----
CA59	4123	4150	----	----
CA59 + EA3	----	----	4180	----
CA59 + TA3	----	----	4182	----
3 sec PV	7606	7605	7604	----
3 sec PV + TA3	----	----	7611	----
12" ped	6101	6102	6100	----
16" ped				

*First head designation is left of door on multiple head framework.

Three-way and four-way frameworks are available. Consult your local Econolite representative.

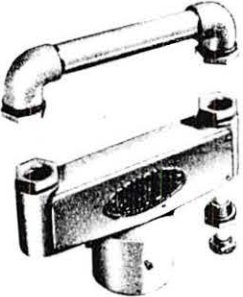
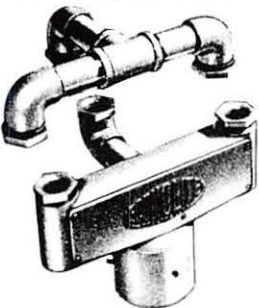
FRAMEWORK

Post Top Mounting

				
Description	One Way	Two Way	Three Way	Four Way
All heads	0501	----	----	----
EA3 standard nipple	----	0506	0513	0514
EA3 long nipple*	----	0508	0520	0521
TA2 or Ped 12 standard nipple	----	6502	----	----
TA3 standard nipple	----	2522	2502	2503
TA3 long nipple*	----	2501	2505	2507
16" ped	----	5230	2505	2507

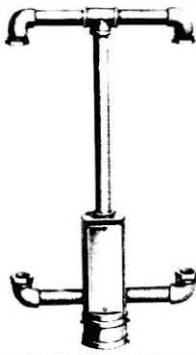
*Long nipple required for backplate

Horizontal Terminal Compartment

		
Two-Way	Two-Way with one Ped ROD	Three-Way No Ped
0322	0337	0339

FRAMEWORK

Post Top with Vertical Terminal Compartment

			
Description	One-Way Right of Door	Two-Way	Three-Way
EA3	0309	0300	0301
EA3 + TA3	----	4305	----
EA3 + TA4	----	4302	----
EA3 + CA35/CA36	----	4304	----
EA3 + CA46	----	4302	----
EA3 + 3 sec PV	----	7618	----
TA3	2314	2300	2305
TA3 + TA4	----	2313	----
TA3 + 3 sec PV	----	7600	----
TA4	2307	----	----
TA5	2317	----	----
TA5 + EA3	----	4336	----
TA5 + TA3	----	2318	----
CA35, 36	4313	4315	----
CA46	4308	----	----
CA59	4333	----	----
CA59 + EA3	----	4337	----
C59 + TA3	----	4338	----
3 sec PV	7610	----	----
3 sec PV + 3 sec PV	----	7615	----
12" pedestrian/TA2	6302	6300	----
16" pedestrian	5242	5203	----

HARDWARE

Spanwire Hangers



Figure 1

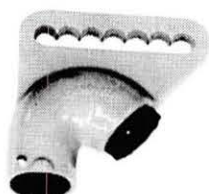


Figure 2



Figure 3

Figure	Description	Aluminum	Bronze
1	Messenger hanger with cable lock bar, "J" bolts & rivet	FW0416A*	FW0416B*
2	Wire entrance with rivet & insulating bushing, without fittings	53547P4	53547P6
3	Balance adjuster, 360°	53530G1*	53530G2*

*Color: G = green; Y = yellow; B = gloss black; X = specify color

Tie Braces



Figure 1

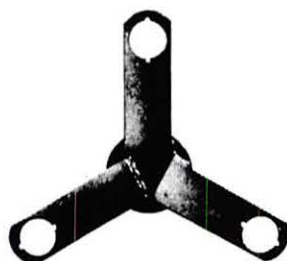


Figure 2



Figure 3

Figure	Description	Part Number
4	Tie brace, ferrous, 2-way span wire	E2022P1**
5	Tie brace, ferrous, 3-way span wire	E2023G1**
6	Tie brace, ferrous, 4-way span wire	E2024G1**

**Color: -11 = green; -12 = yellow; -13 = gloss black; -14 = flat black; -19 = specify color

HARDWARE

Post Top Mounted Adapters

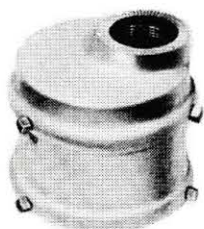


Figure 1

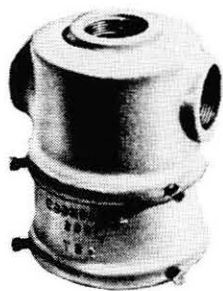


Figure 2

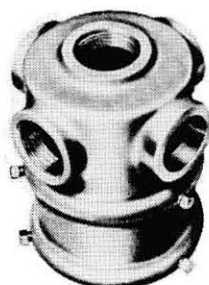


Figure 3

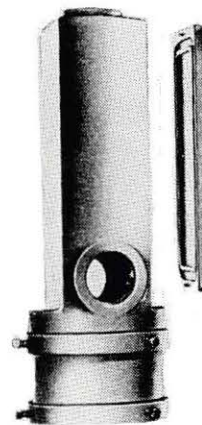


Figure 4

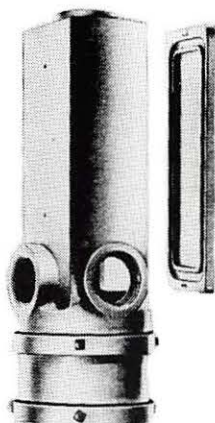


Figure 5

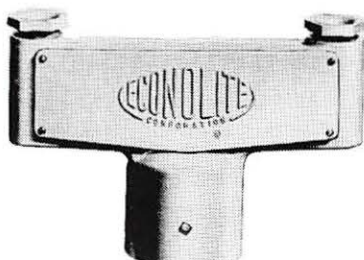


Figure 6

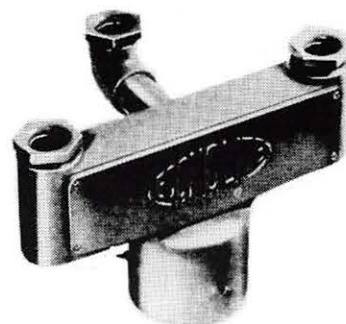


Figure 7

Figure	Description	Bronze	Aluminum
1	Adapter, post-top mounted, 1-way, with Shurlock top port, offset	E2007*	E2029*
2	Adapter, post-top mounted, 2-way, 2 side ports with Shurlock for top port	E2012*	E2031*
3	Adapter, post-top mounted, 4-way, 4 side ports, with Shurlock for	E2040*	E2042*
4	Adapter, post-top mounted, 2-way vertical terminal compartment**	E2000*	E2026*
5	Adapter, post-top mounted, 3-way vertical terminal compartment**	E2002*	E2027*
6	Adapter, post-top mounted, two-way horizontal terminal compartment**	----	E2302*
7	Adapter, post-top mounted, three-way horizontal terminal compartment*	----	E2303*

*Color: G2 = Green; G3 = Yellow; G4 = Gloss black

**Terminal compartments are delivered with door and 12-position pressure type terminal block

HARDWARE

Elbows

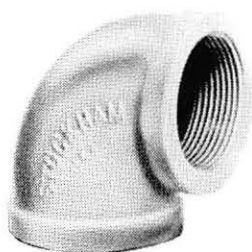


Figure 1

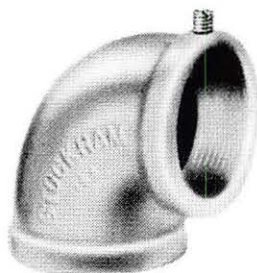


Figure 2

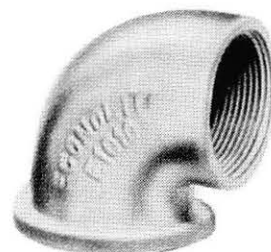


Figure 3



Figure 4

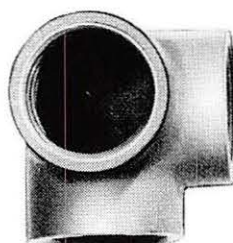


Figure 5

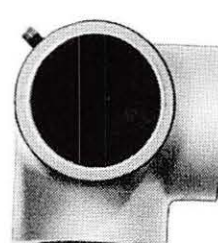


Figure 6

Figure	Description	Part Number
1	Elbow, malleable, banded	E1000P2*
2	Elbow, malleable, one port reamed with set screw	E1001P2*
3	Elbow with flange, malleable	E1010P2*
4	Elbow, malleable, shurlock	E1004P2*
5	Elbow, malleable, side outlet	E1002P2*
6	Elbow, malleable, side outlet, one port reamed with set screw	E1003P2*

*For color add: G = green; Y = yellow; B = gloss black; X = specify color

HARDWARE

Tees



Figure 1

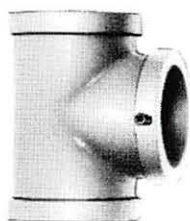


Figure 2



Figure 3

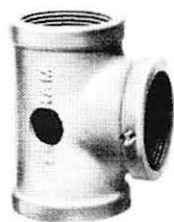


Figure 4



Figure 5



Figure 6

Figure	Description	Part Number
1	Tee, malleable, banded	E1050P2*
2	Tee, malleable, reamed with set screw on outlet	E1051P2*
3	Tee, malleable, reamed with set screw on run	E1057P2*
4	Tee, malleable, reamed w/set screw on outlet - machined for mounting bolt	E1051P12*
5	Tee, malleable, reamed w/set screw on run, machined for mounting bolt	E1057P12*
6	Tee, malleable, shurlock on run	E1053P2*

*For color add: G = green; Y = yellow; B = gloss black; X specify color

HARDWARE

Crosses

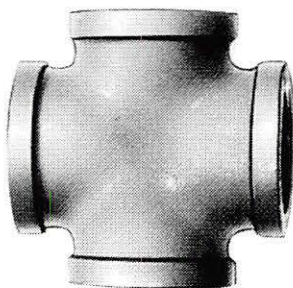


Figure 1

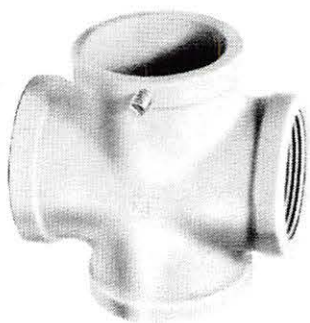


Figure 2



Figure 3

Figure	Description	Part Number
1	Cross, malleable, banded	E1100P2*
2	Cross, malleable, reamed with set screw	E1101P2*
3	Cross with flange, malleable	E1116P2*

*For color add: G = green; Y = yellow; B = gloss black; X = specify color

HARDWARE

Mounting Bolt Assembly



Description	Part Number
Mounting bolt assembly 1/2-13 x 6" long	E2257G1
Mounting bolt assembly 1/2-13 x 7" long	E2258G1
Mounting bolt assembly 1/2-13 x 8" long	E2259G1
Mounting bolt assembly 1/2-13 x 9" long	E2260G1
Mounting bolt assembly 1/2-13 x 10" long	E2261G1
Mounting bolt assembly 1/2-13 x 12" long	E2262G1
Mounting bolt assembly 1/2-13 x 14" long	E2267G1
Mounting bolt assembly 1/2-13 x 16" long	E2256G1
Washer, curved, bronze 5/8" ID, 1-1/2" OD	53313P1
Mounting bolt assembly, 1/2-13 x 16" long with 11" thread	E2255G1
Mounting bolt assembly, 1/2-13 x 18" with 6" thread	E2270G1

All bolts are hot dip galvanized, supplied with square nut, flat washer, lockwasher, and curved bronze washer.

HARDWARE

Nipples and Centerpipes

Figure 1



Figure 2

Figure	Description	Part Number
1	Nipple, close, 1-1/2" x 1-3/4"	E1150*
2	Nipple, NPT both ends, 1-1/2" x 4" (for poly signal)	E1085*
2	Nipple, NPT both ends, 1-1/2" x 5-3/4"	E1229*
2	Nipple, NPT both ends, 1-1/2" x 6" (for poly signal)	E1225*
2	Nipple, NPT both ends, 1-1/2" x 6-1/2"	E1153*
2	Nipple, NPT both ends, 1-1/2" x 8"	E1155*
2	Nipple, NPT both ends, 1-1/2" x 8-1/2"	E1156*
2	Nipple, NPT both ends, 1-1/2" x 9-3/4"	E1231*
2	Nipple, NPT both ends, 1-1/2" x 10"	E1179*
2	Nipple, NPT both ends, 1-1/2" x 10-1/2"	E1180*
2	Nipple, NPT both ends, 1-1/2" x 11"	E1181*
2	Nipple, NPT both ends, 1-1/2" x 12"	E1157*
2	Nipple, NPT both ends, 1-1/2" x 12-1/2"	E1158*
2	Nipple, NPT both ends, 1-1/2" x 14" (for poly signal)	E1227*
2	Nipple, NPT both ends, 1-1/2" x 14-1/2"	E1171*
2	Nipple, NPT both ends, 1-1/2" x 15"	E1172*
2	Nipple, NPT both ends, 1-1/2" x 17-3/4"	E1235*
2	Nipple, NPT both ends, 1-1/2" x 27-3/4"	E1240*
2	Nipple, NPT both ends, 1-1/2" x 41-3/4"	E1243*

NOTE NPT = tapered thread; NPS = straight thread; OE = other end

*For color add: G = green; Y = yellow; B = gloss black; X = specify color

HARDWARE

Nipples and Centerpipes

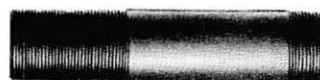


Figure 3

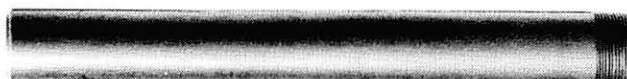


Figure 4

Figure	Description	Part Number
3	Nipple, NPT one end, 2" long, NPS OE 1-1/2" x 13-3/4"	E1233*
3	Nipple, NPT one end, 2" long, NPS OE 1-1/2" x 15-3/4"	E1234*
3	Nipple, NPT one end, 2" long, NPS OE 1-1/2" x 29-3/4"	E1241*
4	Centerpipe, NPT one end, ream and chamfer OE 1-1/2" x 9-1/4"	E1166*
4	Centerpipe, NPT one end, ream and chamfer OE 1-1/2" x 24"	E1159*
4	Centerpipe, NPT one end, ream and chamfer OE 1-1/2" x 28"	E1220*
4	Centerpipe, NPT one end, ream and chamfer OE 1-1/2" x 36"	E1083*
4	Centerpipe, NPT one end, ream and chamfer OE 1-1/2" x 38"	E1139*
4	Centerpipe, NPT one end, ream and chamfer OE 1-1/2" x 50"	E1194*
4	Centerpipe, NPT one end, ream and chamfer OE 1-1/2" x 52"	E1222*
4	Centerpipe, NPT one end, ream and chamfer OE 1-1/2" x 64"	E1224*

NOTE: NPT = tapered thread; NPS = straight thread; OE = other end

*For color add: G = green; Y = yellow; B = gloss black; X = specify color

HARDWARE**Mounting Plate for Poly Signals
(Reference SK-1725)**

Description	Part Number
8-inch signal inside plate with mounting hardware	E1565
8- and 12-inch signal outside plate - no mounting hardware	44738P2
12-inch signal inside plate with mounting hardware	E1566
12-inch signal inside plates elevator plumbizer with mounting hardware	E1567

NOTE: The following frameworks include reinforcing plate which must be installed by customer in polycarbonate signal: FWP0501, FWP0900, FWP0901, FWP0904, and FWP2933.

HARDWARE **Drawing SK-1725**

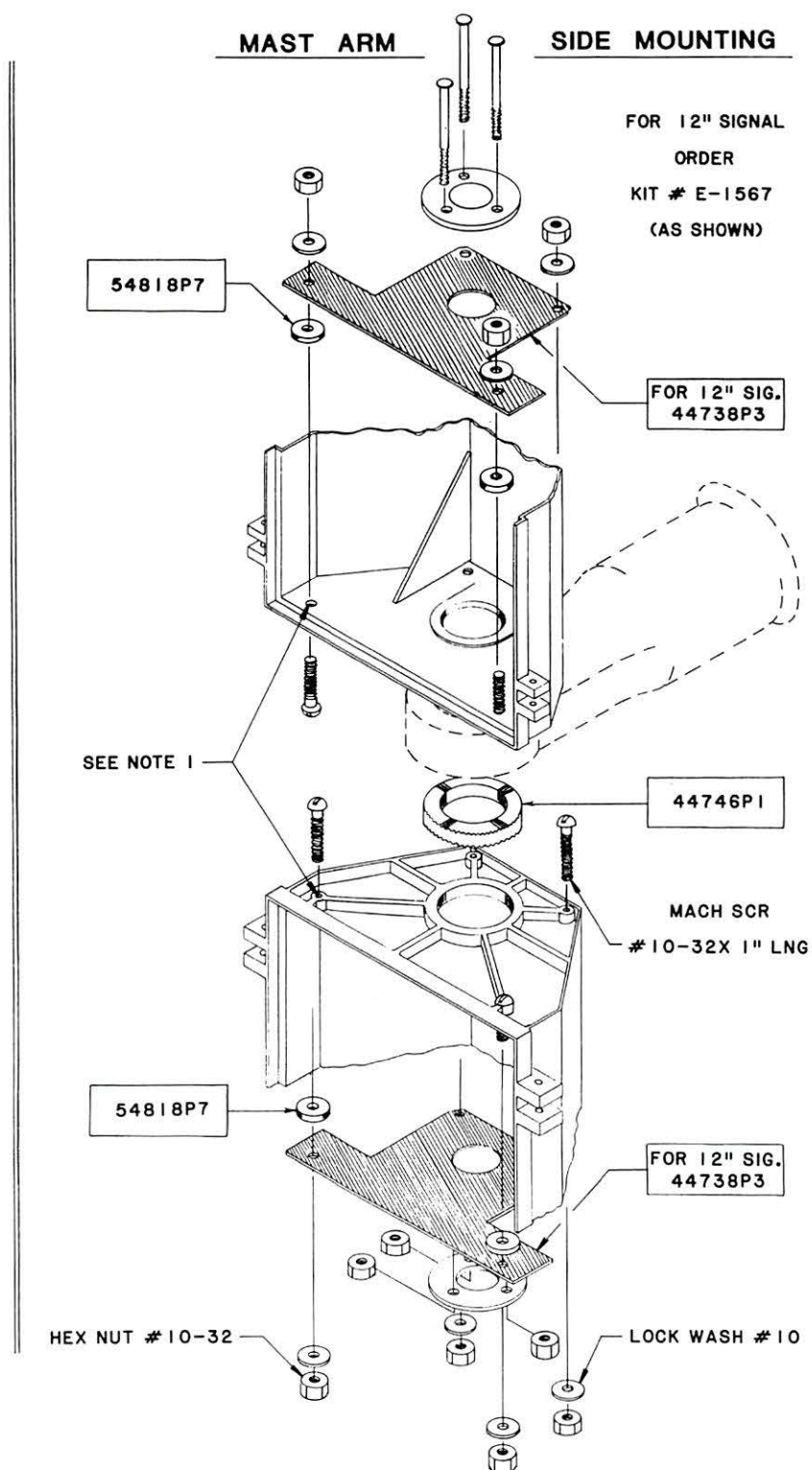


Table of Contents

CABINET ACCESSORIES

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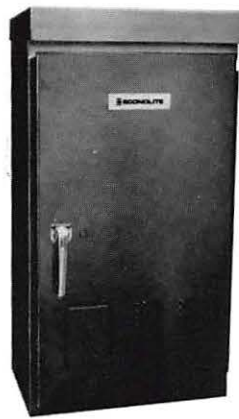
Cabinets & Cabinet Accessories

Features

- Completely Weather-proof
- Flexible Interior Layouts
- Available in Steel or Aluminum
- Easy Access
- Wide Variety of Options



55" CABINET



K CABINET



49" CABINET



77" CABINET



36" CABINET



24" CABINET

Econolite's line of cabinets and cabinet accessories encompass all that is required to attain attractive, durable, easy-access housing for today's complex intersection control equipment. Six sizes of **standard** cabinets are presently available, each offering its own special features, and are available in aluminum or steel.

Econolite offers two types of cabinets:

1. Sheet steel (49, 55, 77) - constructed of 14 gauge copper bearing sheet steel, all welded construction.
2. Sheet aluminum (24, 36, 49, 55, 77) - constructed of 1/8" thick sheet aluminum, all welded construction.

The 24", 36", and K models may be mounted on either wood or steel poles with the wood pole plates or steel pole

clamps which are regularly supplied, or they may be mounted on 4 1/2" O.D. pedestals by means of a pedestal adapter supplied at extra cost. All other cabinets are anchored directly to a concrete footing. These cabinets come without floor to allow a greater latitude in conduit location and provide easy access for conductor connection. Floor supports are provided in all base-mounted cabinets.

All cabinets have full width doors that are properly fitted and gasketed to assure complete weatherproofing. A small "police door" that provides access to a switch panel is conveniently located in the door of all cabinets.

The main doors on all pedestal-mounted cabinets are securely locked by means of

tumbler lock. All base-mounted cabinets are locked at three points which operate from a large easy operating handle that is released by a standard tumbler lock. All "police doors" are locked with a standard police-type lock and key. Two keys are furnished with each lock used.

The doors on all base-mounted cabinets have large louver areas to provide natural ventilation. There is a furnace-type filter located on the inside door.

All base-mounted cabinets are equipped with bar-type stops so that doors may be held in either of two positions to facilitate maintenance.

Standard cabinet mounting accessories are available as options on all cabinets.

24" Cabinet

HEIGHT		WIDTH		DEPTH	
I.D.	O.D.	I.D.	O.D.	I.D.	O.D.
25.88	26.00	17.00	17.50	14.00	15.00

36" Cabinet

HEIGHT		WIDTH		DEPTH	
I.D.	O.D.	I.D.	O.D.	I.D.	O.D.
39.75	40.00	24.00	24.50	16.00	17.25

49" Cabinet

HEIGHT		WIDTH		DEPTH	
I.D.	O.D.	I.D.	O.D.	I.D.	O.D.
48.75	49.00	28.75	30.25	16.63	16.88

K Cabinet

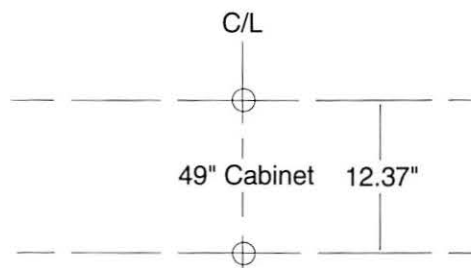
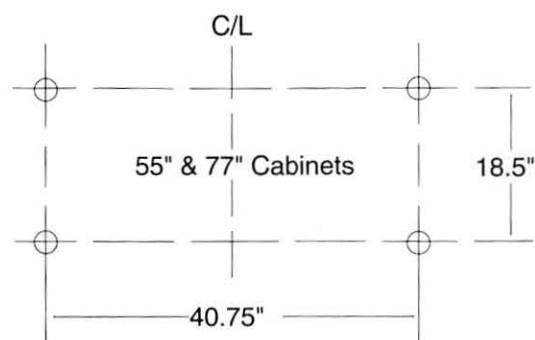
HEIGHT		WIDTH		DEPTH	
I.D.	O.D.	I.D.	O.D.	I.D.	O.D.
50.75	51.00	26.75	27.25	16.75	17.00

55" Cabinet

HEIGHT		WIDTH		DEPTH	
I.D.	O.D.	I.D.	O.D.	I.D.	O.D.
54.75	55.00	43.75	44.25	25.75	26.00

77" Cabinet

HEIGHT		WIDTH		DEPTH	
I.D.	O.D.	I.D.	O.D.	I.D.	O.D.
76.50	76.75	43.75	44.25	25.88	26.00



CABINETS & CABINET ACCESSORIES**Controller Cabinets**

Description	Part Number
24" aluminum cabinet	44950G1
36" (G) aluminum cabinet without police door	32609G4
36" (G) aluminum cabinet with police door	32609G3
51" (K) aluminum cabinet with police door	32483G5
49" (M) steel cabinet with police door	44275G1
49" (M) aluminum cabinet with police door	44274G1
55" (P) steel cabinet with police door	44277G1
55" (P) aluminum cabinet with police door	44276G12
55" (P38) aluminum cabinet with police door	F510550056
77" (R) steel cabinet with police door	44279G1
77" (R) aluminum cabinet with police door	44278G1

- NOTES: - Steel cabinets are painted grey prime on outside and semigloss white inside.
 - Aluminum cabinets are unpainted.
 - 24A cabinets do not include shelves; all other cabinets include two shelves.
 - All cabinets have gaskets and locks (#2 door lock); filters are included where applicable

Anchor Bolts

Description	Part Number
Anchor bolt, 3/4" x 18" x 2-1/2", 4 each required for 40C, 43C, 55S, 55S-1, 77S, 77S-1, 77S-2 cabinets; 2 each required for 49S and 51C cabinets	53049P4

CAB-2

AUXILIARY CABINETS & WEATHERPROOF ENCLOSURES

Description	Type	Part No.
Pedestal cabinet, aluminum	40S	E3725G11
Pedestal cabinet with 4" x 6" window, aluminum	40S	E3725G12
Series lighting enclosure for 1 or 2 visa switch assemblies - 24" H x 18" W x 6" D	--	53505G6
Series lighting enclosure for one visa switch - 24" H x 13" W x 6" D	--	E3750G2
General purpose NEMA III enclosure for housing pole mounted relays, flashers, lighting contactors, etc - 12" H x 7-3/4" W x 5" D	NEMA III	SK546
General purpose NEMA III enclosure as above - 16" H x 10" W x 5" D	NEMA III	SK547
General purpose NEMA III enclosure as above - 18" H x 12" W x 5" D	NEMA III	SK548

*These cabinets are painted green. They can be painted yellow or gloss black, if specified, at no extra cost. All other cabinets furnished prime coated as standard color. For other colors, please consult factory.

CABINET ACCESSORIES & REPLACEMENT PARTS

Description	Part Number
Steel pole clamps	9463480G1
Wood pole clamps	9463481G1
Pedestal adapter for 24S cabinets, G1 green, G2 yellow, G3 aluminum, G4 gloss black	E2004G_
Pedestal adapter for 36S cabinet consisting of E2004G pedestal adapter and 31339G1 plate	E2004G11*

*G = green; Y = yellow; B = gloss black; F = flat black

CABINET ACCESSORIES & REPLACEMENT PARTS

Description	Part Number
Shelf for 24" cabinet (aluminum shelf)	44951P1
Shelf (reinforced for 55" & 77" cabinet - aluminum shelf)	44261P26
Shelf for 36" & 48" cabinet (aluminum shelf)	43270P1
Shelf for 49" cabinet (steel shelf)	44269P2
Shelf for 55" and 77" cabinets (steel shelf)	44261P1
Shelf for 55" & 77" cabinets (aluminum shelf)	44261P16
T-Vent assembly complete with nipples, lock-nuts, washers etc. Specify color required	E5505G1
Air filter for 55" and 77" cabinets (12 x 24 x 1)	57389P2
Air filter for 48" and 49" cabinets (12 x 16-1/2 x 1/2)	57389P1
Air filter holder	32194P2
Line filter model SHP300-10	31637P4
Line filter model ACP340	31637P5
35-amp mercury contactor (N.C.)	44039P2
60-amp mercury contactor (N.C.)	44039P4
60-amp radio interference suppressor	32456P1
Surge protector 350 V, 40 A gas tube	54857P3
Base for surge protector	54859P1
Print envelope, plastic, 10" x 12"	53887P1
Print envelope, plastic 12" x 18"	53887P2
Vent fan (muffin type with ball bearing)	44214P2
Connector cord for vent fan	44216P1
Screen for vent fan	44217P1
Finger guard for vent fan	44215P1
Thermostat assembly	44620G2
10 amp circuit breaker, magnetic	54571P1
15 amp circuit breaker, magnetic	54571P2
15 amp circuit breaker, hydraulic	31688P3

CAB-4

CABINET ACCESSORIES & REPLACEMENT PARTS (continued)

Description	Part Number
20 amp circuit breaker, hydraulic	54571P3
30 amp circuit breaker, hydraulic	54571P4
30 amp circuit breaker, hydraulic	31688P1
40 amp circuit breaker, magnetic	54571P5
50 amp circuit breaker, magnetic	54571P6
60 amp circuit breaker, magnetic	54571P7
60 amp circuit breaker, hydraulic	31688P2
Quencharc	43029P1
Relay (K1 and K2 on main panel)	54408P38
Lock, Best, dead bolt, main door 36", 49", 55" and 77" cabinets	54309P12
Lock Corbin #2, dead bolt main door 36", 49", 55" & 77" cabinets	108A3002P2
Subtreasury lock, used on main door 24" cabinet and on all police doors	9462273P1
Key for subtreasury lock	20X917
Key for Corbin #2 lock	IR6380
Switchpack socket (12-pin female)	54648P1
Flasher socket (6-pin female)	54648P18
Relay socket (8-pin female)	54648P20
Spring nut 10/32	32360P1
Spring nut 1/4-20 narrow	32360P2
Spring nut 1/4-20 wide	32360P3
Terminal block 6-position (field type)	55897G6
Terminal block 8-position (field type)	55897G8
Terminal block 12-position (field type)	55897G12
Ground bus bar 14-position (bus bar only)	40498P1
Stand-off for isolated ground bus bar	58066P3
Ground fault indicator convenience outlet	40109P1

CABINET ACCESSORIES & REPLACEMENT PARTS (continued)

Description	Part Number
Bracket, magnetic circuit breaker	44704P1
Duplex convenience outlet	54325P2
Fuse holder - auxiliary panel	31274P1
Main switch, 50 amp	55110P1
Switch, SPTT	54146P1
Switch, 4PTT	9463089P6
Switch, SPDT	E5511P1
Switch, SPST	E5510P1
Door switch (normally closed contacts)	55832P1
Door switch (normally open contacts)	55832P2
Manual switch with 3 ft straight cord	9464238P1
Manual switch with 6 ft straight cord	9464238P2
Manual switch with 6 ft retractable cord	9464238P10
Switch, DPDT	9463090P7
Switch, detector test, pushbutton	53363P1
Flash transfer relay	40691P1
Ped isolation transformer	32457P1
Spacer	4865515P4
Screw 10-32 x 3/4"	32361P3
Flat washer	32708P1
Nut for channel	32360P1
Blank panel for 4 P/B relay	44645P1
Detector loop surrestor SRA-16C	32376P1

CAB-6

INTERFACE BOARDS AND CONNECTING CABLES

Description	Part Number
Pedestrian pushbutton isolation card for 8, 12, 16 position & PC panels	32050G1
Pedestrian pushbutton isolation card for hardwired panel	31555G1
Pedestrian pushbutton board assembly 4-channel	33500G1
Preemptor interface board (KMCE)	44840G1
Connecting cable for preemptor interface board	44844G1
Telemetry interface board	32380G1
Connecting cable for telemetry interface board to ASC 8000 or KMCE	31690G10
Connecting cable for telemetry interface board to KFT	31690G11
Solid state optoisolation board	31590G2
Connecting cable from optoisolation board to ASC-8000 D connector (D interface board not needed)	44784G3
Connecting cable from optoisolation board to KMCE coord module	44784G2
ASC 8000 "D" connector interface board	32560G1
Relay (subminiature for D panel)	57446P1
Connecting cable from ASC 8000 to "D" interface panel	32231G60
Connecting cable from D interface or telemetry interface to detector rack	32346G4
Connecting cable from D interface to optoisolator panel	32346G7
Relay clip for D panel	54334P10

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CAB-8

TS2 TYPE 1 MAIN PANEL AND AUXILIARY EQUIPMENT



Fig. 1

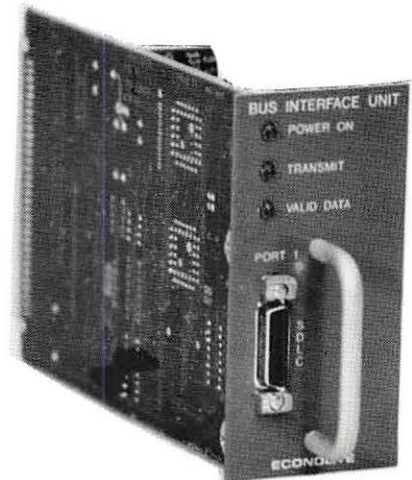


Fig. 2

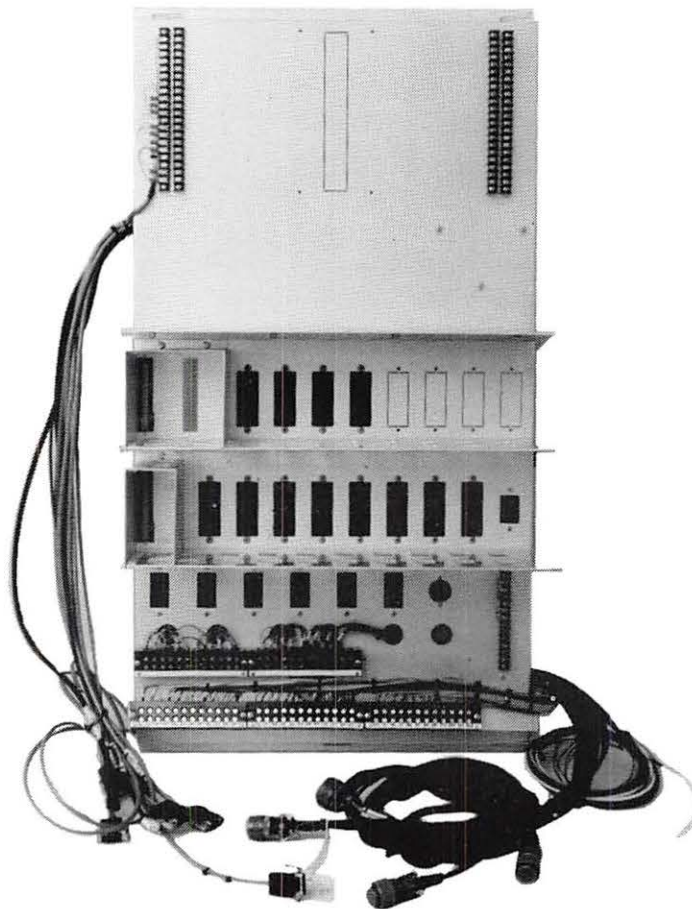


Fig. 3

TS2 TYPE 1 MAIN PANEL AND AUXILIARY EQUIPMENT

Ref.	Description	Part Number
1	Cabinet Power Supply	33510G1
2	Bus interface unit	32860G1
3	Main Panel - 12 position	33535G1
3	Main Panel - 16 position	33535G2

CAB-10

TS2 TYPE 2 MAIN PANELS

Fig. 1

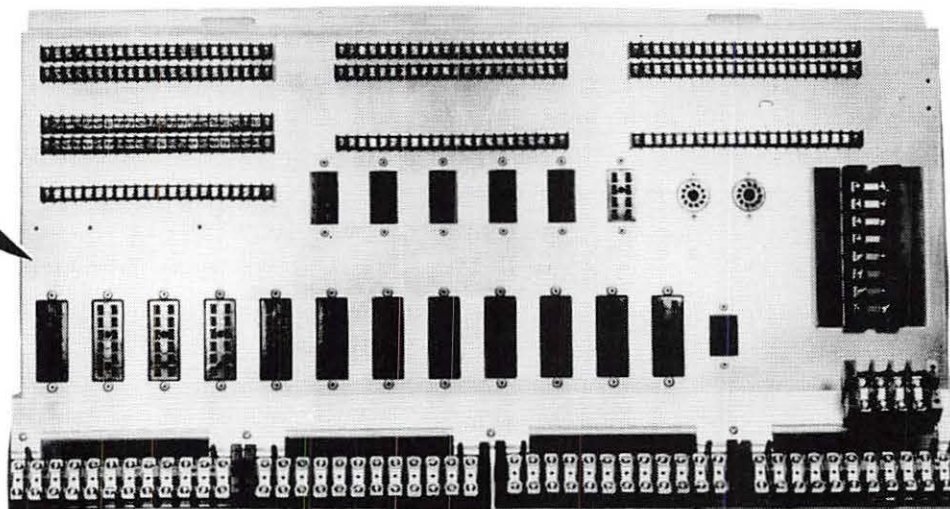


Fig. 4

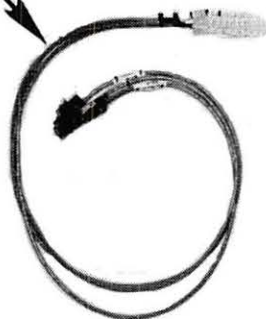


Fig. 2

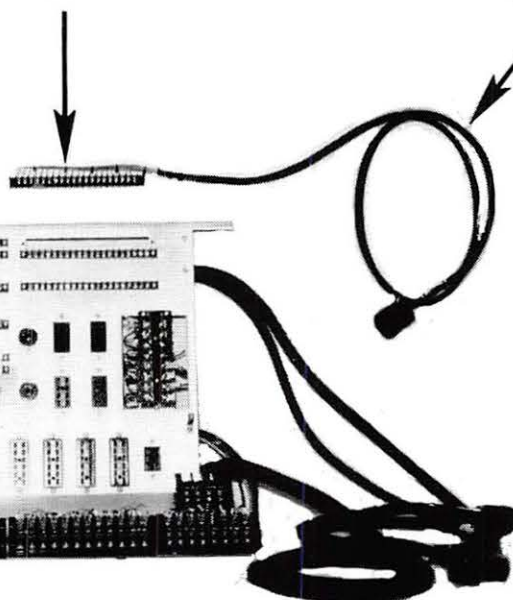


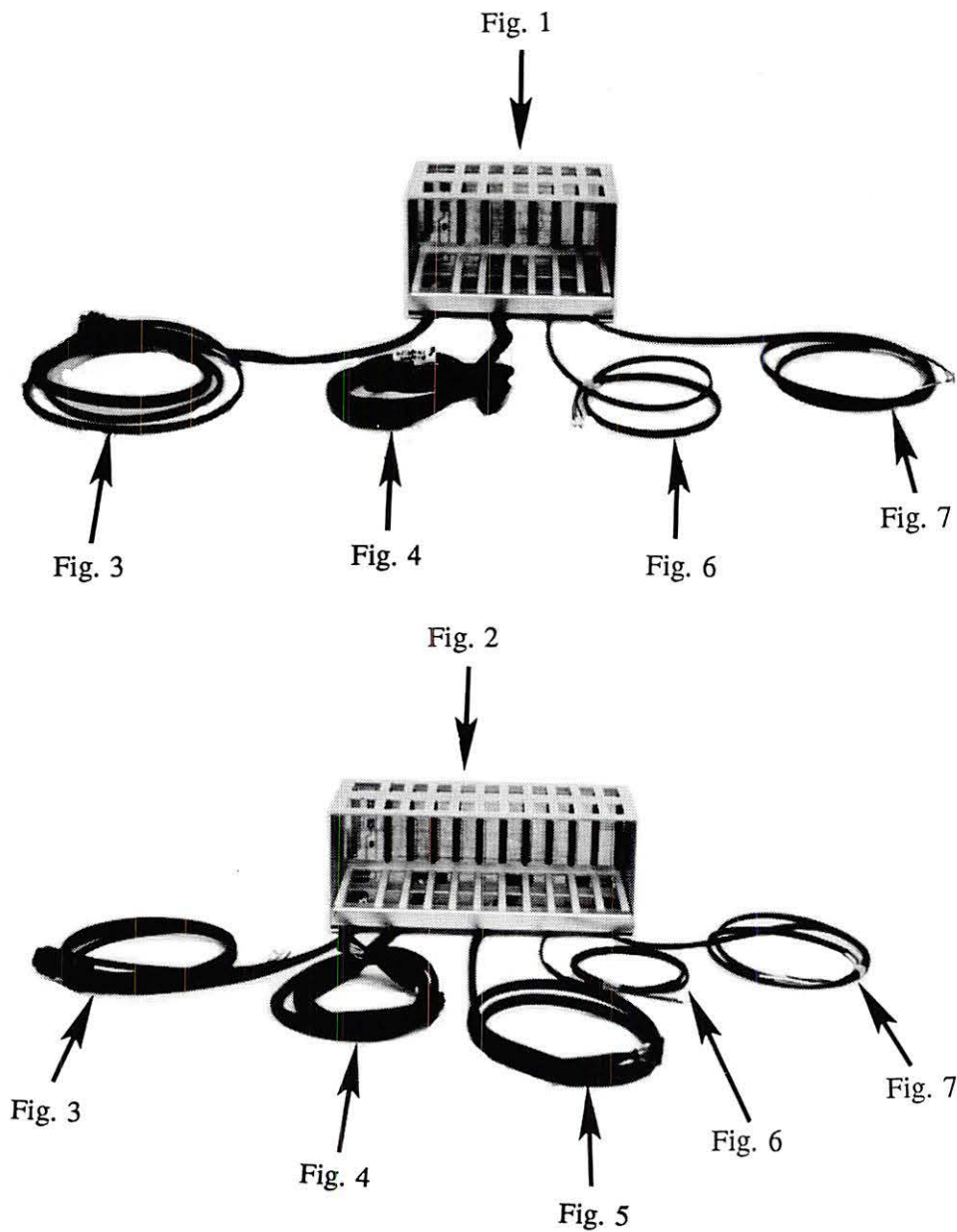
Fig. 3



TS2 TYPE 2 MAIN PANELS

Ref.	Description	Part Number
1	Main panel 8 phase (wired for Type 16 MMU)	33570G1
2	Main panel 4 phase (6 channel CMU)	33565G1
2	Main panel 4 phase (wired for Type 16 MMU)	33565G2
3	Harness assembly "C" cable (option)	33550G1
4	Harness assembly SDLC (option)	33550G2

TS2 DETECTOR RACKS



TS2 DETECTOR RACKS

Ref.	Description	Part Number
1	Rack detector 8 loop cabinet	33292G1
2	Rack detector 16 loop cabinet	33293G1
3	Harness assembly detector rack power	33284G1
4	Harness assembly detector rack loops 1-8	33284G2
5	Harness assembly detector rack loops 9-16	33284G3
6	Harness assembly detector preempt outputs	33284G4
7	Harness assembly preempt power	33284G5

CAB-14

TS2 CABINET AUXILIARY EQUIPMENT

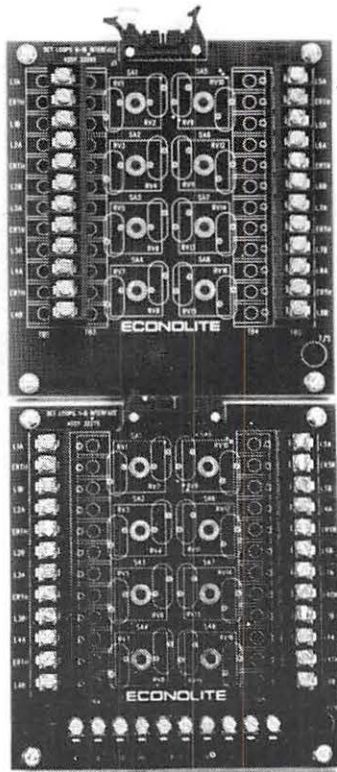


Fig. 2

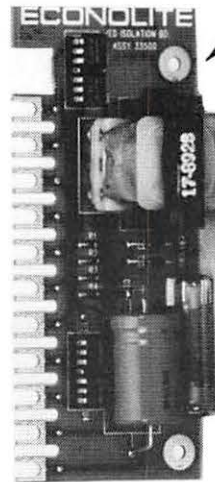


Fig. 10

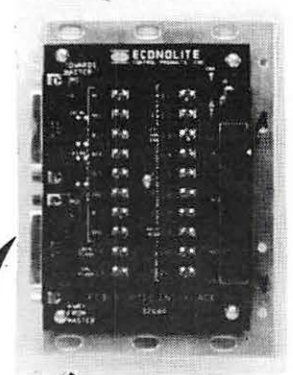


Fig. 9

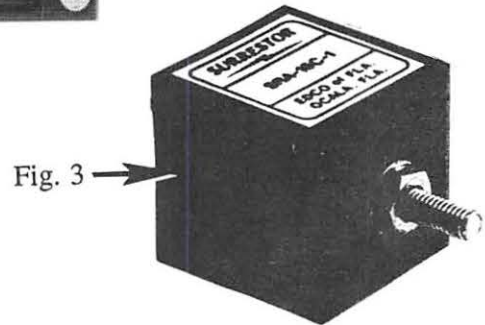


Fig. 3

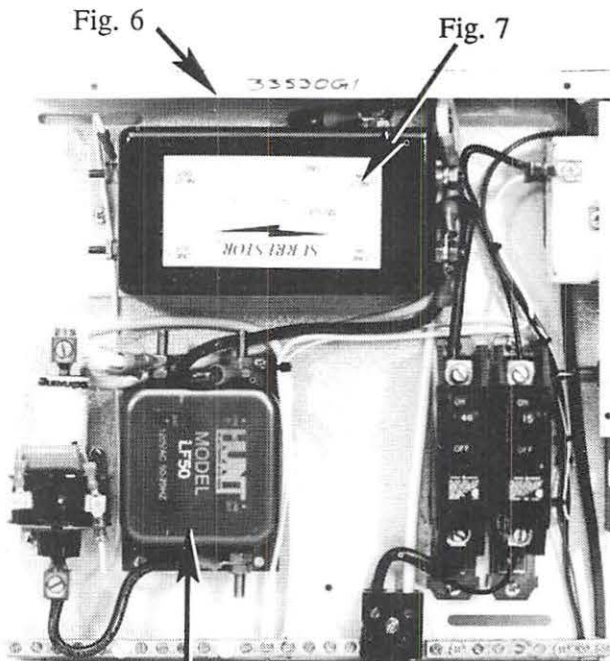


Fig. 6

Fig. 7

Fig. 8

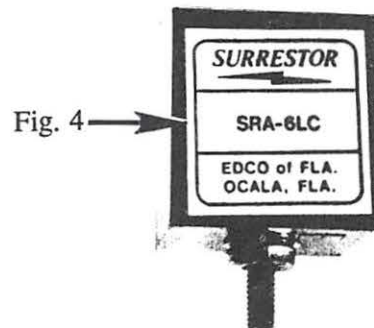


Fig. 4



Fig. 5

TS2 CABINET AUXILIARY EQUIPMENT

Ref.	Description	Part Number
1	PC assembly detector interface board 8 loops	33294G2
2	PC assembly detector interface board 9-16 loops	33294G1
3	Surge arrestor (Edco Model SRA-16C-1)	32376P1
4	Surge arrestor (Edco Model SRA-6LC)	32376P2
5	Surge arrestor (Edco Model SRA-6LCA) (must add 2 more terminal blocks)	32376P3
6	Power panel	33530G1
7	Surrestor (Edco model ACP340)	31637P5
8	Radio interference filter	32456P4
9	Telemetry interface panel (fiberoptics)	32680G*
10	Ped isolation PCB assembly (4 channel)	33500G1
11	Telemetry interface panel w/suppressor and 9 pin connecting cable	33580G1
12	PC assembly master I/O interface	33265G1
	Harness assembly - master I/O	32864G3

*Specify modem type and cable type to be used (consult factory)

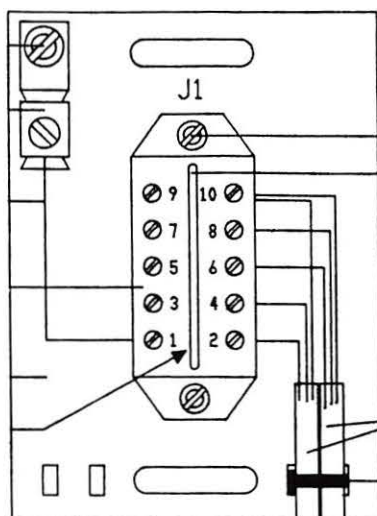


Fig. 11

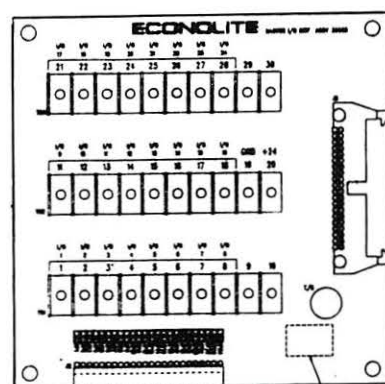
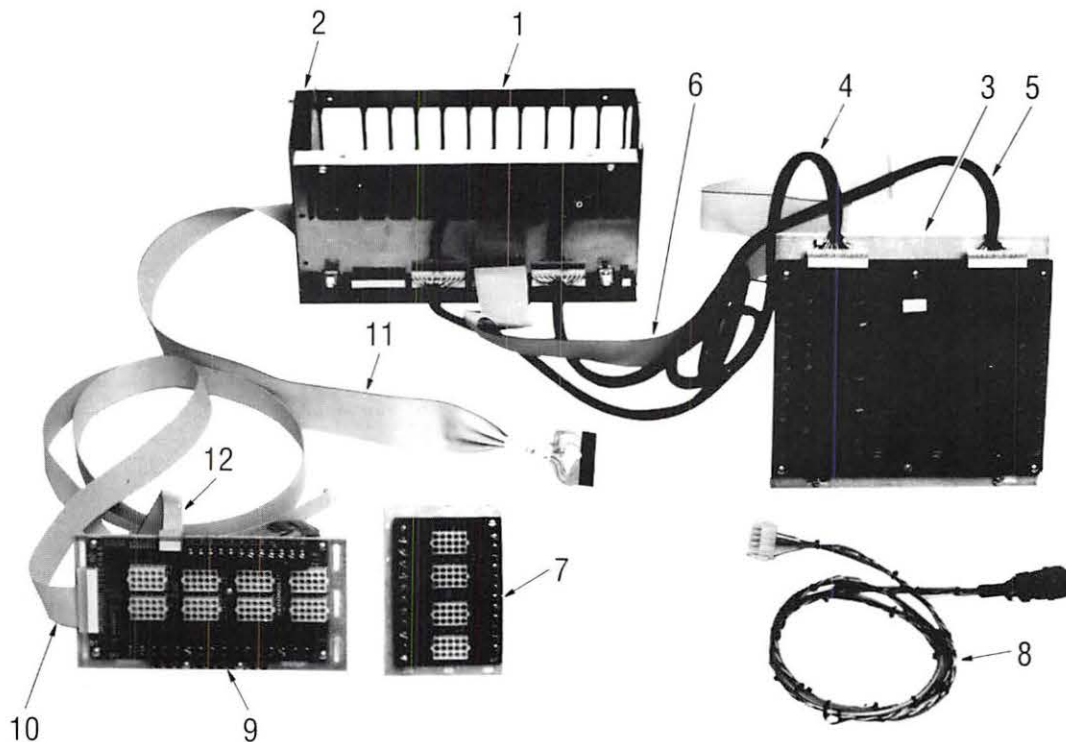


Fig. 12

CAB-16

TS1 DETECTOR RACKS AND AUXILIARY EQUIPMENT

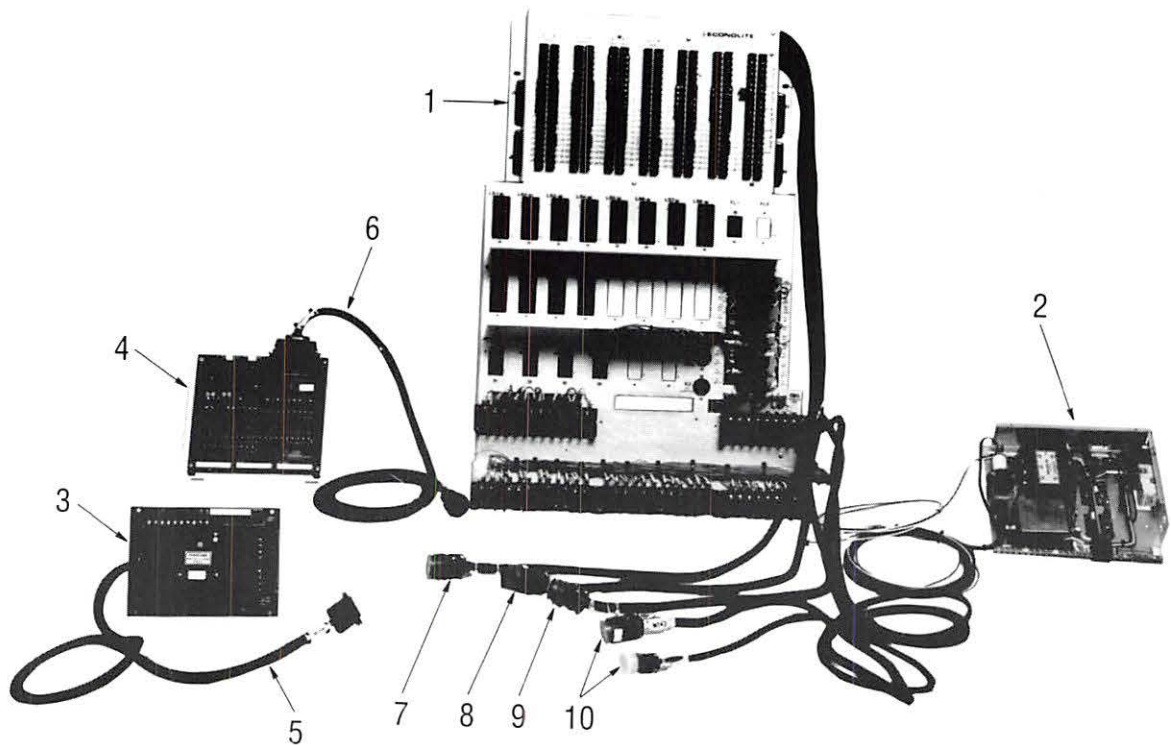


TS1 DETECTOR RACKS AND AUXILIARY EQUIPMENT

Ref.	Description	Part Number
1	Detector rack (free standing, not attached to shelf)	32270G2
1	Detector rack (attached to shelf)	32270G3
2	Detector rack program card	32280G1
3	Detector interface panel without varistors	32300G1
3	Detector interface panel with varistors	32300G2
4	Detector interface panel connecting cable (detectors 1 to 10)	32348G1
5	Detector interface panel connecting cable (detectors 11 to 18 and PE)	32348G2
6	Detector C/C rack J16 to telemetry interface or D interface	32346G4
7	Detector board, 4 channel	31765G1
8	Connecting cable (hardwire) for one-channel loop detector sensor	40130G2
8	C/C from detector board to one-channel loop detector sensor	40130G3
	C/C from detector board to four-channel loop detector sensor	43876G3
	C/C from detector board to two-channel magnetic sensor (Canoga)	43039G3
9	Detector board, 8 channel	32660G1
10	Connecting cable for one 8-channel detector board	32659G45
	Connecting cable for two 8-channel detector boards	32659G46
11	Single detector rack connecting cable J1 for new main panel	32659G40
6	Detector rack C/C J14 to telemetry I/F for dual output detectors	32346G9
	Double detector rack connecting cable J1 for new main panel	32659G42
	Single detector rack connecting cable J14 for new panel	32659G41
	Double detector rack connecting cable J14 for new main panel	32659G43
	Detector rack connecting cable J16 to both D and telemetry I/F panel	32346G8
	Connecting cable for double rack (PCB main panel)	32231G42
	Jumper for detector program card	32344P1
12	C/C from 8 channel detector board to telemetry or D interface panel	32594G1
	Varistor for detector interface board	31770P1

CAB-18

**TS1 MAIN PANEL, WIRED CABINET
ASSEMBLIES & CONNECTING CABLES**



TS1 MAIN PANEL, WIRED CABINET ASSEMBLIES & CONNECTING CABLES

Ref.	Description	Part No.
1	4-position main panel with 3 channel CMU C/C (fits in 24" or larger cabinet)	44925G1
1	8-position main panel with 6 channel CMU C/C (fits in new 36" cabinet, K cabinet and larger)	32650G1
1	8-position main panel with 12 channel CMU C/C (fits in new 36" cabinet, K cabinet and larger)	32650G2
1	12-position main panel with 12 channel CMU C/C (fits in 49" cabinet and larger)	32655G1
1	16-position main panel with 12 channel CMU C/C (fits in 49" cabinet and larger)	32655G2
2	Power panel NEMA flash	32465G4
2	Power panel California flash	32465G41
3	Telemetry interface panel	32380G1
4	D connector interface panel	32560G1
5	Connecting cable for telemetry interface panel to KMCE, ASC-8000, or ASC/2-2100	31690G10
6	Connecting cable from ASC-8000 or ASC/2-2100 to D interface panel	32231G60
7	Connecting cable A for KMC-2000/4000/8000, KMC-VT4000, ASC-8000, or ASC/2-2100	32649G1
8	Connecting cable B for KMC-4000/8000, KMC-VT4000, ASC-8000, or ASC/2-2100	32649G2
9	Connecting cable C for KMC-8000, ASC-8000, or ASC/2-2100	32649G3
10	Connecting cable NEMA 3 channel CMU*	44661G1
10	Connecting cable NEMA 6 channel CMU*	44661G2
10	Connecting cable NEMA 12 channel CMU*	44661G3

*Connecting cables have CMU connector on one end, no connector on other end.

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LightSaver™

2 KVA, 3 KVA & 5 KVA Standby AC Power and AC Line Conditioning for Traffic Signs & Signals

Overview

LightSaver™ is an on-line uninterruptible power supply (UPS) which produces no-glitch, true-sine-wave standby AC power. It has three main functions. The first is to provide AC power in the event of a short power loss, thus keeping the intersection operating for the duration of the outage. The second is to provide a level of signal operation during extended outages, thus providing time for service and traffic control personnel to respond. The third is to constantly filter out spikes, noise, lightning surges and other disturbances from incoming power, thereby reducing equipment failures and false trips of the CMU.

Recommended applications

- ☐ Geographical areas which are subject to frequent lightning storms and power interruptions.
- ☐ Geographical areas with electrically-noisy electrical power and brownouts.
- ☐ Critical intersections, such as urban intersections which control the access to a bridge or tunnel, where a power failure would cause massive traffic tie-ups.
- ☐ Intersections with preemption, which are near a fire station or on the usual path of emergency vehicles.
- ☐ Intersections at railroad crossings, where signals are used to protect motorists from the path of onrushing trains. Such signals may include NO RIGHT TURN and NO LEFT TURN blackout signs.
- ☐ Overhead lane-control signals, where a power failure could lead to head-on collisions.
- ☐ Illuminated warning signs at hazardous locations, such as flashing RED SIGNAL AHEAD diamond sign preceding a blind intersection.
- ☐ Illuminated signs which direct motorists at complex intersections.
- ☐ Variable Message Signs (VMS and CMS), which warn motorists of emergencies and hazardous traffic conditions.
- ☐ Reversible one-way detours, bridges and tunnels, where the motorist cannot see the other entrance. The detour may be at a temporary construction site with frequent power interruptions, and the LightSaver system may be portable.
- ☐ Intersections with a system master which controls an arterial or network, as the loss of the master would cause loss of communications within the entire system.
- ☐ Intersections at remote locations, where a field service call would be expensive.



utility power, any spikes or transients are attenuated by a factor of 1000:1, thus eliminating problems due to noise on the power line. The output voltage is regulated to 120 V $\pm 3\%$ for utility voltages from 95 to 135 V, thus providing both brownout and overvoltage protection.

While operating from utility power, LightSaver recharges its batteries after each usage at the maximum safe current to minimize recharge time. It then maintains a temperature-controlled float voltage at minimum current to maximize battery life.

2. Standby operation

Should the utility voltage fall below 95 V or drop out altogether, an inverter starts in about one-quarter cycle (4 ms) to maintain continued output power to the traffic system using battery power. Synchronizing circuits assure that the inverter comes on in-phase with the last utility power cycle, and a crystal oscillator maintains a constant 60 Hz line frequency during standby operation.

Operating Modes

1. Normal line operation

The heart of the LightSaver circuit is a ferroresonant transformer, which isolates the input from the output and passes through a clean, voltage-regulated 60 Hz sine wave. During normal operation with

When the utility voltage returns to the restart level, a programmable restart delay assures that the line voltage has stabilized before returning LightSaver to normal line operation. During this delay, the inverter phase is synchronized with the utility line to avoid any disturbance when the transformer is reconnected to the line and the inverter is switched off.

MUTCD Uniform Code Flash (UCF) is initiated when LightSaver sends a UCF command to the controller upon the first occurrence of Phase 2 and Phase 6 inputs. In all cases, UCF will be initiated before any shutdown due to low batteries.

Three standby operating modes are programmable by plug-in jumpers:

2.1 Flash mode standby

Here the intersection operates in UCF mode upon going to standby. This mode maximizes the battery operating time by minimizing the number of lights that are on at the same time.

2.2 Reduced load standby

The intersection operates on full load for a board-programmable period of time (0 to 18 minutes), then in UCF mode. This mixed mode provides a median battery operating time.

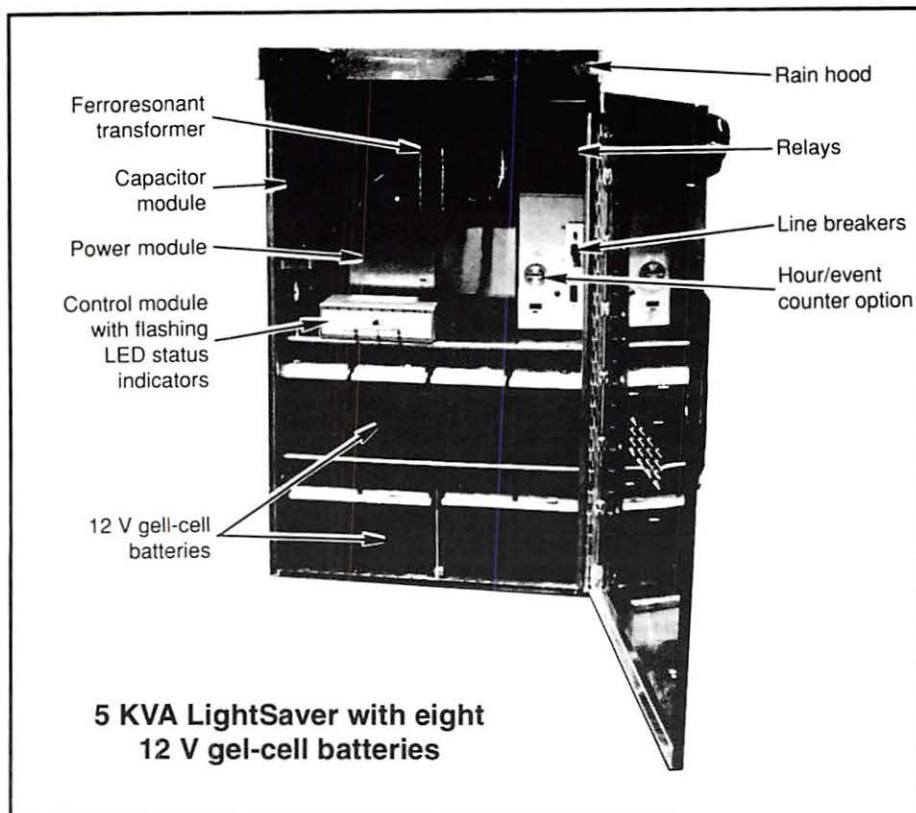
2.3 Full standby

The intersection operates on full load until the Low Battery Point is reached. It then operates in the UCF mode for 1 minute before shutdown. This modest provides the longest normal traffic control.

Hardware Overview

Physically, LightSaver consists of an aluminum cabinet, which houses a ferroresonant transformer, the electronics and 12V gel-cell batteries. Mounting kits allow LightSaver to be mounted on its own pad, to be attached to the outside of an existing controller cabinet, or to be attached to a utility pole.

LightSaver is available in three power ratings: 5 KVA (41.7 A), 3 KVA (25 A) and 2 KVA (16.7 A). The 5 KVA unit should handle the largest 8-phase intersections, but it is wise to measure actual current draw with a clamp-on ammeter. The 3 KVA and 2 KVA units are recommended for smaller intersections and for lane control signals.



Battery cabinets are available for 4 or 8 gel-cell batteries. At the full 25 A output of the 3 KVA unit, the nominal duration of standby power is 30 minutes with 4 batteries and 60 minutes with 8 batteries. For currents "I" other than 25 A, multiply these times by 25/I.

Technical Features

The technical features of LightSaver make it suitable for outdoor traffic control application and differentiate it from conventional standby and UPS power systems.

1. Outdoor rated

LightSaver is gasketed for outdoor installation and meets NEMA specifications for operating temperature, humidity and utility voltage. The aluminum cabinets are corrosion resistant and rugged. The wall thickness is 0.190" for the housing and 0.125" for the door.

2. NEMA-level signals

All input/output signals meet NEMA specifications. Standard signals are Phase 2 and Phase 6 inputs, Standby Mode output and Uniform Code Flash (UCF) output. Thirteen additional optically-isolated NEMA outputs are available through an optional Status Monitor Board to allow

comprehensive remote diagnostics. Ten LED diagnostic lamps are standard.

3. The best of UPS & standby

The inverter of LightSaver is only energized when needed for standby operation. This provides longer component life and higher power efficiency than conventional UPS systems, where the inverter is always on line. A proprietary 60 Hz synchronizing circuit allows the transfer to standby without the use of a transfer relay. This avoids the time-outs and switching transients associated with standby systems.

4. Gel-cell batteries

LightSaver uses state-of-the-art, long-life, 100 AH, deep-cycle gel-cell batteries, which are totally maintenance-free and are guaranteed not to leak, spill or stratify in stationary applications.

5. Fail-safe provision

In the event that the ferroresonant transformer or the electronics should fail, LightSaver automatically defaults to a fail-safe mode, connecting the traffic system to utility power. This is accomplished by de-energizing three fail-safe relays. The transfer to fail-safe takes less than 400 ms, so that all controllers meeting the NEMA TS1 or TS2 standards will continue to operate as though no power interruption had occurred.

6. Maintenance & Warranty

LightSaver is warranted for a full 3 years, excluding the batteries. These are warranted by their manufacturer for 1 year, but typical battery life will be 3 to 5 years (warm climates) to 7 to 10 years (cold climates). The batteries should be checked semi-annually. Battery testers are available from Lectro Products and from local auto parts stores.

Specifications

1. AC input (line operation)

AC input voltage..... 95 to 135 VAC
AC input current, max..... 50 A, 30 A, 20 A
(5 KVA, 3 KVA, 2 KVA models)
AC input frequency 60 Hz $\pm$ 1 Hz

2. AC output (line operation)

AC output voltage 120 VAC rms $\pm$ 3%
AC output current, max..... 42 A, 25 A, 17 A
(5 KVA, 3 KVA, 2 KVA models)
AC output frequency Same as input
AC output waveform Sine wave
Isolation..... Via transformer
Transient suppression ratio..... 1000:1

3. AC output (standby mode)

AC output voltage 105 VAC rms $\pm$ 2%
AC output current, max..... 42 A, 25 A, 17 A
(5 KVA, 3 KVA, 2 KVA models)
AC power output, max:
4200 VA, 2500 VA, 1700 VA
(5 KVA, 3 KVA, 2 KVA models)
AC output frequency 60 Hz $\pm$ 0.003 Hz
AC output phase Synchronized with
60 Hz line at power failure and
again at return to line operation

AC output waveform Sine wave
Isolation..... Via transformer
Load for stable operation .. Zero to full load
Standby time at maximum current output:

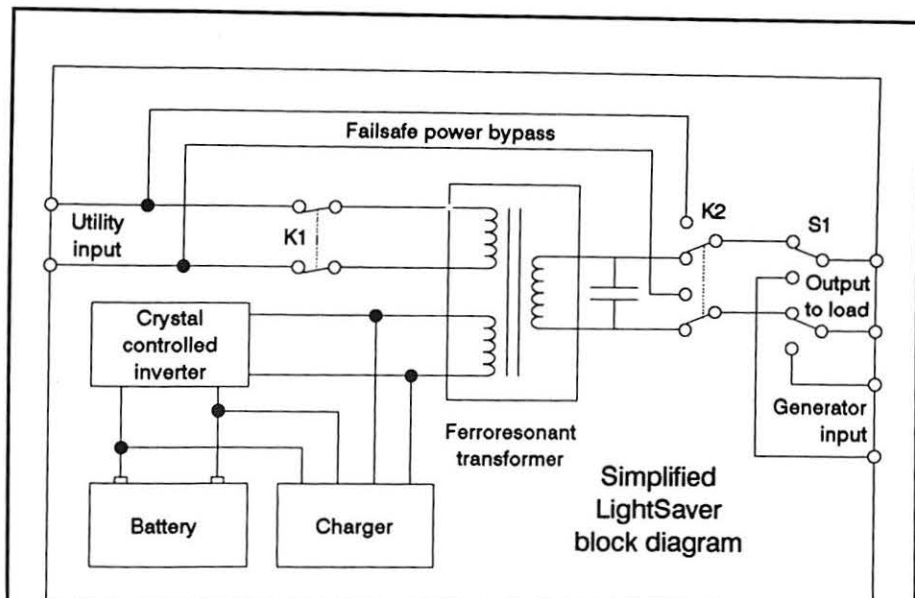
8 batteries..... >36 min, >60 min, >76 min
4 batteries..... >18 min, >30 min, >38 min
(5 KVA, 3 KVA, 2 KVA models)

Inverter enable time < 10 ms
Low battery "flash command" cutoff.. 43 V
Absolute battery cutoff 39 V
Provisions against premature return to line
power operation:

1. Restart delay jumper programmable
from 8 s to 64 s.
2. Detection of low voltage corresponding
to marginal utility source impedance.

4. Brownout detection

Brownout detection level..... 95 VAC
Return to normal level..... 105 VAC
Brownout detection time, max 1/4 cycle



Understanding LightSaver

During normal operation, the primary relay K1 is closed to connect the utility power to the ferroresonant transformer input. The FR transformer provides conditioned, voltage-regulated sine-wave output power to the traffic load through the normally energized relay K2. The battery charger derives its power through the inverter winding of the transformer and maintains a current-limited, temperature-compensated float voltage on the batteries.

Should utility power fail or fall below the 95 V brownout level, control circuits turn on the inverter and release the primary relay K1 to prevent feeding power back into the utility lines. Timing for the inverter is constantly synchronized with the utility frequency so that backup power is in sync with the last utility power cycle. This avoids any glitches which may affect digital electronics in the traffic control system. Because the FR transformer is also the in-

verter transformer, the output power to the load will still be a voltage-regulated sine-wave.

When power is reapplied to the utility lines, there is a delay of a few seconds to ensure that utility power is stable and to allow the inverter to resynchronize with the line frequency. At that point, relay K1 is closed and the inverter is turned off.

Relay K2 is a fail-safe relay, which is powered from the output of the transformer. Should the power supply system ever fail, it automatically establishes a direct connection to utility power. Switch S1 is optional and allows manual switching of the load to an auxiliary generator for long-term outages.

The proprietary circuit used in LightSaver avoids the slow transfer relay used in conventional standby power systems and avoids having the inverter on-line at all times, as in conventional UPS systems.

5. Overload protection

Line operation Current/voltage foldback plus resettable circuit breaker

Standby operation Solid state protection circuits for over-voltage, over-current, over-temperature and low battery. Resettable circuit breaker for batteries.

6. Transformer

Type..... Ferroresonant

Windings..... Power in, power out, inverter/charger.

Insulation..... Class 180, (H)

Cooling Integrated mounting brackets and laminations to transfer heat to cabinet

7. Fail-safe relays

Transfer time to fail-safe < 400 ms

Electrical contacts ... 60 A, sealed mercury

8. Ground isolation

Power circuits..... May be installed with all lines (input and output) floating or with input and/or output neutrals grounded.

Battery and electronics ... All lines floating. Grounding of any line or LED circuit will not cause failure or injury. LED indication of grounded battery common.

NEMA I/O signals..... 1000 V opto-isolated

9. NEMA outputs

Maximum voltage (external) 30 VDC

Maximum current (sink) 200 mA

Standard NEMA outputs:

1. Standby mode
2. Flash command

10. NEMA inputs

Maximum voltage..... 30 VDC

Maximum current..... 10 mA at 24 VDC

Standard NEMA inputs:

1. Phase 2 green
2. Phase 6 green
3. +24 VDC power in

11. Battery charger

Type .. Variable duty cycle, full-wave SCR

Charge rate, max..... 10 A

Current limit Automatic

Charge level..... Temperature-controlled float voltage level, 54.8 VDC at 25°C

Protection..... Automatic current limit after 12 to 97 hrs (programmable) to protect against defective battery.

12. Controls

Line input Combined main power switch and circuit breaker

Battery..... Combined battery switch and circuit breaker

Test Latching pull-button forces standby operation; door interlock resets switch to normal upon closing door.

13. Indicators

Type Flashing LEDs visible in sunlight

Functions Indicated:

1. Phase 2 and Phase 6 green
2. Low battery
3. Restart delay
4. Normal
5. Standby
6. Overload
7. Check battery
8. Current limit
9. Float voltage
10. Charge

14. Cooling

Standby operation..... Full-time fan

Normal operation Fan controlled by adjustable thermostat

15. Batteries

Type 12 V, 100 AH, sealed lead acid

Model Johnson Controls GC12V100

Quantity per cabinet 4 or 8

16. External connections

Power I/O..... #10 AWG screw terminals

NEMA I/O..... #6 AWG screw terminals

Status Monitor I/O..... 25-pin D connector

Wiring/interface ports..... 1 1/2" conduit holes with tamper-proof plugs

17. Options

Event/Timer Module..... Indicates number of standby events and cumulative standby time with resolution to 0.01 hrs.

Generator hookup..... Connector and toggle switch to transfer load from LightSaver to external generator.

Power Jumper Connector..... Provision to bypass LightSaver and feed utility power directly to load.

Status Monitor Board Adds 13 NEMA diagnostic outputs & 2 NEMA inputs.

Additional NEMA outputs:

1. Low battery
2. Flash command
3. AC OFF
4. Charging
5. Current limit
6. Check battery
7. Float voltage
8. Standby mode
9. Overload
10. Control voltage OK
11. Absolute low battery
12. Inhibit ON
13. Forced ON

Additional NEMA control inputs:

1. Forced standby
2. Inhibit standby

18. Mechanical

Height..... 49.5"

Width..... 30.5"

Depth 17.5"

Weight, 2 KVA model 185 lbs

Weight, 3 KVA model 215 lbs

Weight 5 KVA model 360 lbs

Weight, 100 AH batteries (each) 70 lbs

Standard mounting Ground-mount of single cabinet on separate concrete pad

Optional mounting..... Over/under or side-by-side mounting of separate electronic and battery cabinets via adjustable rails.

19. Construction

Cabinets..... Aluminum, 0.190" thick for all major cabinet components, 0.080" thick for internal assemblies.

Door assemblies Aluminum, 0.125" thick. Continuous hinge, 3-point door latch with single keyed locking handle and pad-lock hasp.

Cabinet finish Painted or aluminum

Weather proofing Gasketed doors and weep holes for drainage

Mounting hardware Kit supplied with all required SAE hardware.

Ventilation Screened rear vents for battery cabinet, filtered and screened forced air via front vents for electronics cabinet.

20. Environmental

Operating temperature..... -30°F to +165°F (-34°C to +74°C)

Humidity ... 0 to 100% RH, non-condensing

Ordering Guide

Electronics cabinet

MA3010-E. 2 KVA unit

MA3000-E. 3 KVA unit

MA3011-E. 5 KVA unit

Batteries (4 or 8 required)

BT0007. 12 V, 100 AH battery.

Add-on options

OCH-100-E. Electromechanical hour/event counter. Records cumulative standby time and number of outages.

PK3003-E. Generator input connector and switch. Allows connection to external generator without interrupting traffic system.

PK3004-E. Power bypass plug. Allows direct operation of traffic system from power line.

OSL001-E. Status monitor board. Provides 11 additional opto-isolated, NEMA-compatible outputs for remote diagnostics.



ECONOLITE
CONTROL PRODUCTS, INC.

3360 E. La Palma Ave., Anaheim, CA 92806-2856
P.O. Box 6150, Anaheim, CA 92816-0150
Telephone: (714) 630-3700 FAX: (714) 630-6349

MANUALS

Description	Part Number
ASC/2 Series Programming	37524
ASC/2 Maintenance	37527
ASC/2M-1000 Zone Master Maintenance	37528
ASC/2M-1000 Zone Master Programming	37525
ASC-8000 Controller, Maintenance	37501
ASC-8000 Controller, Programming	37502
ASC-8000 Controller Rack Mount, Maintenance	37503
ASC-8000 Controller Diagnostic Program	32444
Autoscope Users	37523
Emtrac Narrow Band	37520
Emtrac Spread Spectrum	37526
Intersection Data Manager, Installation & Operation	37518
Intersection Monitor Diagnostic Program	32435P1
Intersection Monitor II, Maintenance	37516
KFT Controller, Operations & Programming	37506
KFT Diagnostic Program	32148P1
KFT-1800/2400 Cabinet Insert, Maintenance & Installation	37505
KMC Telemetry, Operation & Maintenance	37509
KMC VT-4000, Operation & Maintenance	37515
KMCE Diagnostic Program Test	32428P1
KMC-10,000 Diagnostic Program Test	31952
KMC-10,000 Zone III Master, Operation & Maintenance	37504
Zone Monitor, Installation & Operation, Version 2	37517
Zone Monitor IV, Installation & Operation	32707
Terminology of Controllers & Signal Systems	No P/N

MISC-2

LOAD SWITCHES

Description	Part Number
Three-circuit load switch with indicator lights on input and output - diagnostic. Three replaceable modules (TSC #300-OI)	31095G12
Three-circuit load switch with indicator lights on inputs. Discrete components (TSC #200)	37006P1
Three-circuit load switch with indicator lights on inputs. Three replaceable modules (TSC #300)	31095G10
Jumper plug	32448G1

RACK MOUNTED DETECTORS

Model No.	Description	Part Number
222C	2-channel - thumbwheel & toggle switches	44665G22
222CR	2-channel - thumbwheel & toggle switches	44665G21
222D	2-channel DIP switches	44665G20
222DR	2-channel DIP switches	44665G23
262C	2-channel with timing thumbwheel and toggle switches	44665G24
262CR	2-channel with timing thumbwheel and toggle switches	44665G25
224C	4-channel thumbwheel and toggle switches	44665G26
224D	4-channel DIP switches	44665G27
262FC	2-channel has standard, accucount and loop fail outputs	44665G6
272	2-channel, same as 262FC except connector on front for system output	44665G28
724C	4-channel thumbwheel and toggle switches	44665G29
724D	4-channel DIP switches	44665G30
205	Power supply	32463P2

All detectors have loop monitor feature

R = Relay output

MISC-4

SHELF-MOUNTED DETECTORS

Model No.	Description	Part Number
815	Bicycle detector, no loop monitor	44664G6
815-SS	Bicycle detector, no loop monitor	44664G14
910	Single channel	44664G20
910-SS	Single channel	44664G21
913	Single channel with timing	44664G22
913-SS	Single channel with timing	44664G23
913F	Single channel with timing and failed loop signal	44664G29
913F-SS	Single channel with timing and failed loop signal	44664G30
919-1	Single channel with timing and system detector output	44664G31
919-1SS	Single channel with timing and system detector output	---
921-2T	Two channel with timing	44664G32
921-2TSS	Two channel with timing	44664G33
940	Four channel - single connector	44664G27
940-SS	Four channel - single connector	44664G28

All detectors have loop monitor feature except as noted

SS = solid state output

CONFLICT MONITOR UNITS

Description	Part Number
Three-channel NEMA CMU model NSM-3L	44693G11
Six-channel NEMA CMU model NSM-6L	44693G20
Twelve-channel NEMA CMU model NSM-12L	44693G21
Three-channel NEMA special sequence model SSM-3L	*
Six-channel NEMA special sequence model SSM-6L	44693G22
Twelve-channel NEMA special sequence model SSM-12L	44693G23
Six-channel NEMA with LCD model SSM-6LE	*
Twelve-channel NEMA with LCD model SSM-12LE	44693G16
Eighteen-channel NEMA with LCD model SSM-18LE	44693G18

* Consult factory

CONNECTING CABLES FOR CMU/MMU

Description	Part Number
Connecting cable NEMA three-channel CMU	44661G1
Connecting cable NEMA six-channel CMU	44661G2
Connecting cable NEMA twelve-channel CMU	44661G3
Connecting cable sixteen-channel MMU	44693G30

G1, G2, & G3 - Plug on one end only

MISC-6

TEST EQUIPMENT

Description	Part Number
Suitcase tester for ASC 8000 actuated controller. Hard wired controller test cables.	32555G1
Diagnostic PROM w/IC socket and instruction manual for ASC controllers. To be used with 32555G1 tester or appropriate 31647 loop-back cables.	32442G2
Diagnostic PROM w/IC socket & instruction manual for KMCE controllers with new 2764 PROMs. To be used with 44611G1 tester or appropriate 31647 loop-back cables.	32429G3
Diagnostic PROM w/IC socket & instruction manual for KMCE controllers with old 2716 PROMs. To be used with 44611G1 tester or appropriate 31647 loop-back cables.	32429G4
Diagnostic PROM w/IC socket and manual for KMCE-10,000 Controller with 2764 PROMs. To be used with appropriate 31647 loop-back cables.	32436G2
Diagnostic PROM w/IC socket and manual for KMCE-10,000 controller w/2532 PROMs. To be used with appropriate 31647 loop-back cables.	32436G3
Diagnostic PROM w/IC socket and instruction manual for KMC variable timed controllers. To be used with 44611G2 tester or appropriate 31647 loop-back cables.	31753G1
Loop-back cable A for KMC-2000, KMC-4000, KMC-8000, KMC-VT4000 or ASC-8000	31647G1
Loop-back cable B for KMC-4000, KMC-8000 or ASC-8000	31647G2
Loop-back cable B for KMC-VT4000	31647G4
Loop-back cable C for KMCE-8000 or ASC-8000	31647G3
Loop-back cable for telemetry module.	31647G5
Loop-back cable for preemptor module.	31647G6
ASC-8000 extender cable for telemetry module access	32503P8
Loop-back cable for ASC-8000 terminal - connector	31647G13
Loop-back cable for standard coordination module.	31647G7
Loop-back cable to NIC/coordination module.	31647G8
Loop-back cable for NIC/Coord. Module download port.	31647G11

NOTE: Loop-back cables run automatic diagnostics of KMC & ASC controllers when using the proper diagnostic PROM.

TEST EQUIPMENT (continued)

Description	Part Number
Loop-back cable for D connector of ASC-8000	31647G12
Loop-back cable for KMCE-10,000	31647G9
AC power cable for KMCE-10,000 and Intersection Monitor	31647G10
Diagnostic PROM with IC socket and manual for Intersection Monitor. To be used with the following loop-back cables.	32435G2
Intersection Monitor loop-back cables for DC signals I/O	32249G1
Intersection Monitor loop-back cables for AC signals I/O	32249G2
ASC RM diagnostic PROM kit	32589G1
Diagnostic PROM with IC socket and manual for KFT controller back panel and the equipment.	32148G3
Loop-back cable for KFT 18/24 Controller.	32147G1
AC Power cable for KFT Controller.	32147G2
Connecting cable for KFT CMU reset module.	32147G4
Relay subbase used to test KFT phases 5 & 6 red.	32147G5
Loop-back cable for NIC module w/o telemetry.	32147G6
Loop-back cable for NIC module with telemetry.	32147G7
Extender card for KMC series controllers	31707G1
Extender card for expanded KMC controllers	31795G1
50-pin ribbon extender for KMC series controllers	31589P4
60-pin ribbon cable extender for KMC series controllers	31589P5
Printer interface module with KMC-2/4/8 print software	31650G401
Loop back cable A for ASC/2	33279G1
Loop back cable B for ASC/2	33279G2
Loop back cable C for ASC/2	33279G3
Loop back cable D for ASC/2-2100	33279G4
25-pin telemetry loopback cable (FSK) for ASC/2-2100	33279G5
9-pin telemetry loopback cable (RS-232) for ASC/2	33279G6
SDLC loopback cable for ASC/2	33279G7
Terminal loopback cable for ASC/2	33279G8

MISC-8

FLASHERS & FLASHING BEACON CONTROLLERS

Description		Part Number
Solid-state flasher NEMA 20-amp single circuit	(TSC #2026)	44623P4
Solid-state flasher NEMA 15-amp double circuit	(TSC #2017 C/E)	44623P1
Solid-state flasher Type F, 4 pin, 20 amp, single circuit	(TSC #2001B)	44623P2
Solid-state flasher, Type F, 4 pin, 10 amp, double circuit	(TSC #2002B)	44623P3

REPLACEMENT PARTS FOR SINGLE CIRCUIT FLASHER

Description	Part Number
Casing only	9462274P1
Moving contact upper	53386G1
Stationary contact upper	9483806G1
Cam	9483805P1
Screws for stationary contact	N37P15010C
Set screw for cam and pin	N70P1302
Spring for upper moving contact	9463737P1
Pin short (upper)	9483808P1
Mounting jack	9483545P1
Choke coil assembly	9460522G1
Condenser assembly for single circuit flasher	9463614G1
Rotor unit	9904889P7
Lead to stationary contact	9463615P3
Lead to motor	9463615P5

PARTS FOR DOUBLE CIRCUIT FLASHER

Description	Part Number
Condenser assembly for 2-circuit flasher	175A656G1
Spring for moving contact lower	9463737P2
Pin long (lower)	9483808P2
Stationary contact lower	175A650G1
Moving contact lower	53386G2